Research Report
KTC-00-06

KENTUCKY TRANSPORTATION CENTER

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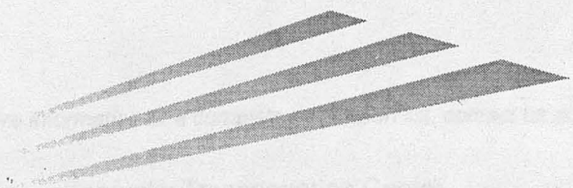
I-275 Warrantied Pavement, Boone/Kenton Counties Kentucky



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I-275 Warrantied Pavement, Boone/Kenton Counties, Kentucky

by

R. Clark Graves, P.E., P.G.
Transportation Research Engineer

and

David L. Allen, P.E., P.G.
Transportation Research Engineer

Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, Kentucky

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February 2001

INTRODUCTION

Project Description

Interstate 275 in Boone and Kenton Counties (MP 1.05 - 7.15) has been in service for more than 20 years. This rehabilitation project consists of the eastbound lanes from MP 1.04 - 4.07 and both east and westbound from MP 4.07 - 7.15 The westbound lanes from MP 1.04 - 4.07 were rehabilitated in 1991

Original Project Design

The original pavement design consisted of continuously reinforced concrete pavement in the westbound direction from MP 1.05 - 4.07. The remaining pavement was conventional 11" of PCC pavement over 6" of DGA with a keyway between driveing lanes. The project was broken into to design sections based on projected traffic loadings as follows:

Section 1

I - 275, Boone/Kenton Counties Kentucky
Eastbound from MP 1.05 - 4.06
3 - lanes
Original Construction--1973
11" Jointed Reinforced Concrete Pavement over 6" of Dense-Graded Aggregate Base

MP 1.99 - 4.06
56,000 AADT, 11.5% Trucks
14,603,000 Equivalent Single Axle Loads (ESALs)* for 20 years; 29,206,000 ESALs* for 40 years

MP 1.05 - 1.99
76,000 AADT, 11.5% Trucks
21,400,000 ESALs* for 20 years; 42,400,000 ESALs* for 40 years

Section 2

I-275, Boone County, Kentucky
East and Westbound MP 4.06 - 7.15
3-lanes
Original Construction--1977
11" Jointed Reinforced Concrete Pavement over 6" of Dense-Graded Aggregate Base

47,000 AADT, 11.5% Trucks
10,700,000 ESALs* for 20 years; 21,400,000 ESALs* for 40 years

*Note: ESALs calculated using Kentucky Load Equivalency Factors (Report No. UKTRP-81-17, Kentucky Transportation Center, University of Kentucky, 1981).

Rehabilitation History/Maintenance History

The westbound lanes from MP 1.05 - 4.07 were rehabilitated in 1991. This rehabilitation consisted of the rubblization of the existing continuously reinforced PCC pavement, the addition of a 4-inch asphalt treated drainage blanket followed by a 9" conventional PCC pavement.

The remainder of the project has seen increasing deterioration of the pavement structure in recent years. The historical rideability of the project is given in Figure 1. Figures 2 and 3 illustrate typical distress which was found throughout the project. Extensive patching of the deteriorated joints had become overwhelming. During a project recently completed which retrofitted the shoulder joints with dowels to facilitate the maintenance of traffic for the major rehabilitation, a separate item was included to do extensive full width patching of distressed areas. This activity virtually eliminated the need to continue to do pothole patching. The net effect was to provide for a consistent foundation for the anticipated rehabilitation.

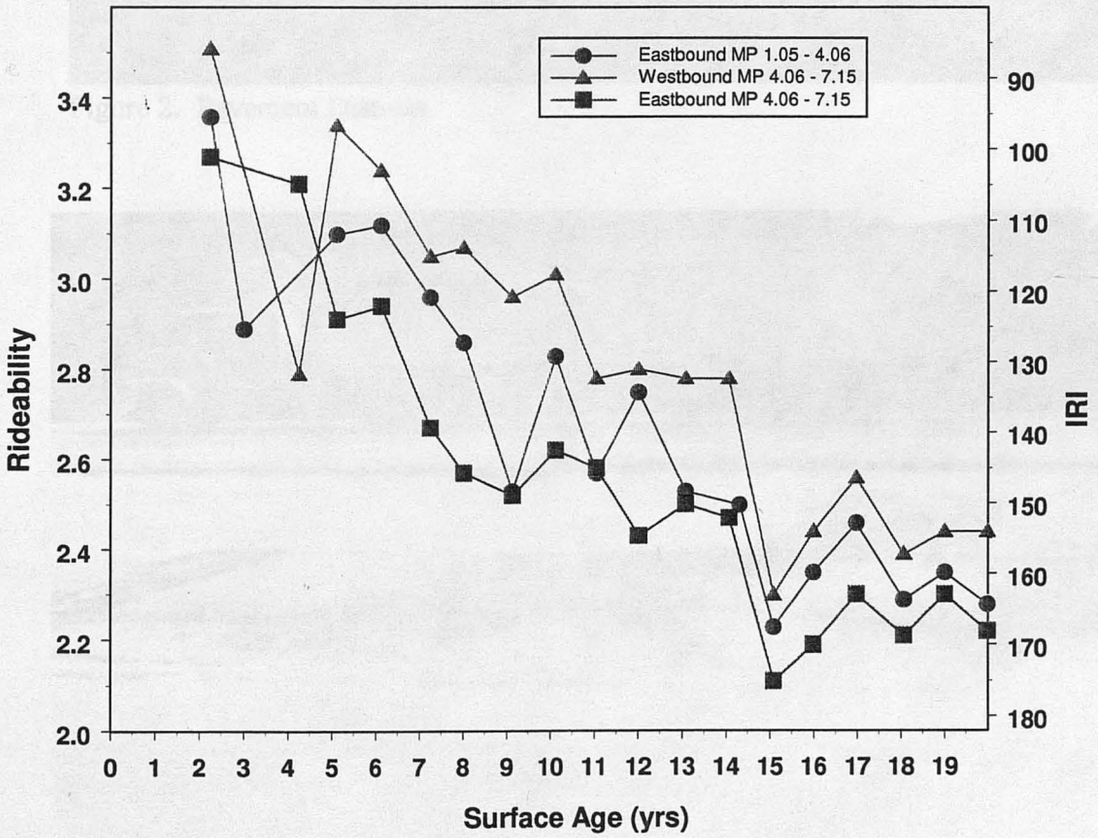

Figure 1. Historical Rideability

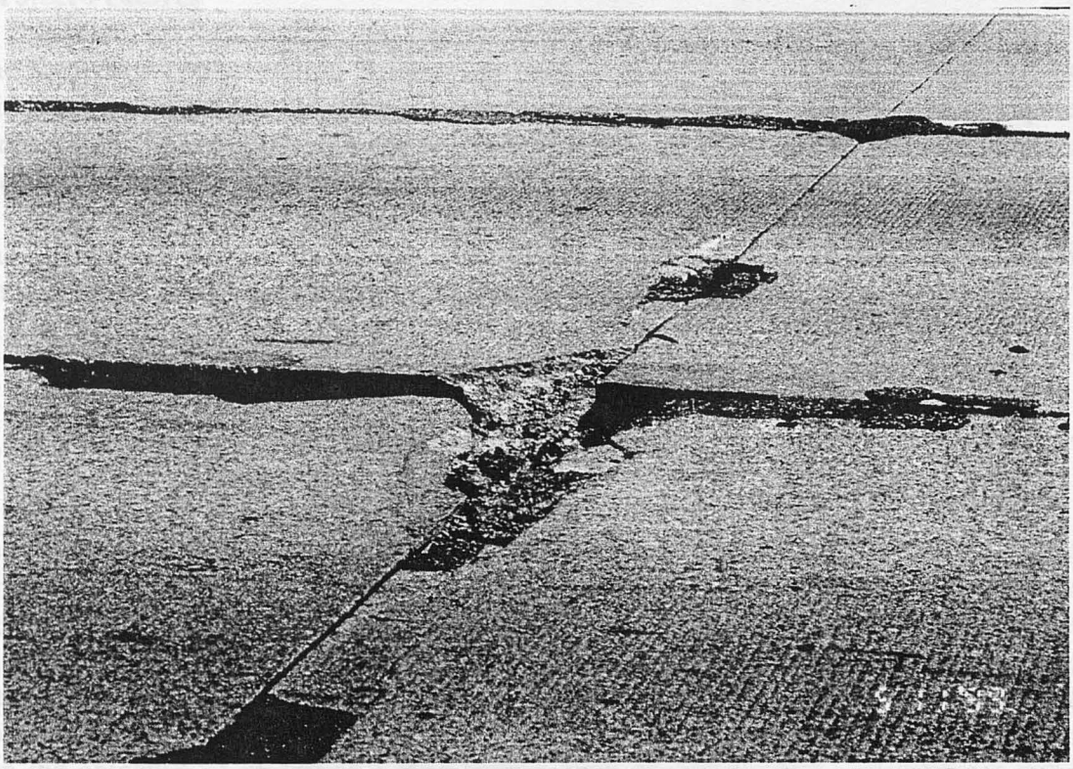

Figure 2. Pavement Distress

Figure 3. Pavement Distress

Unique Project Features

The Kentucky Transportation Cabinet has been working to develop performance-related specifications and enhanced QC/QA programs into their new 2000 Specifications. It is anticipated that these changes will be cost effective and will enhance the long-term performance of the projects on which they are used.

The next logical step in this process was to evaluate the feasibility of using warranties on projects. It is anticipated that constructing a warrantied pavement structure would;

- Stimulate contractor workmanship to lead to improved pavement performance,
- Encourage more competition,
- Stimulate contractor innovation,
- Potentially reduce the overall project life-cycle-cost.

As will be illustrated later in this report, a life-cycle cost analysis done for the purpose of determining the most cost-effective rehabilitation strategy indicated that over a 40- year period, there was no significant difference in life-cycle cost for an overlay using asphalt concrete when compared with a structurally equivalent overlay using Portland cement concrete. The lack of a clearly preferred alternative was the basis for bidding alternative pavement types on this project. The addition of warranties for workmanship for each pavement type also is believed to more clearly focus each industry on the objective of providing a long-lasting, high-quality product. Furthermore this is believed to minimize functional differences between the two pavement types.

The pavement warranties provided a means to share the responsibility between the contractor and the Transportation Cabinet for constructing a quality product. Bidding alternative pavement types allowed two competing industries to bid on a selected project and provide the Transportation Cabinet with a five-year to a 10-year warranty. Each pavement type was designed to meet the same structural requirements over a 40-year analysis period. Therefore, the two alternative designs could be considered structurally equivalent. The combination of a warranty and the alternate bidding provided a potential means to functional equivalence between the alternatives during the warranty period. This was accomplished by developing performance levels for pavement smoothness (ride quality) and other distresses such that the two alternate pavement types were functionally equivalent. In addition, it allowed the contractor to utilize innovative concepts to modify various aspects of the construction process to meet the performance requirements established. This process also assisted in maintaining a consistent level of service and workmanship for the project throughout the warranty period.

This warrantied project extended beyond the typical bidding of a fixed warranty, and it allowed the contractor the option of extending the basic five-year warranty to a maximum of 10 years. Each additional year of warranty permitted the contractor to receive a credit to be used to determine the successful bidder.

Background and History of Project Bidding

Kentucky has historically selected successful bidders in the traditional manner described below:

- Total Labor and Materials – "A " type bidding
- Owner Specifications – "Method Specifications"
- Contract Time – Working Days or Fixed Completion Date

In recent years Kentucky has used an "A + B" type of bidding concept for selected projects. This concept is described as follows:

- Total Labor and Materials – "A"
- Owner Specifications – "Method Specifications"
- Contract Time – Owner assigns a value of working day and the Contractor bids the number of working days to completion at an owner assigned rate – "B"
- Low Bid is evaluated on the Basis of "A + B"

The bidding procedure evaluated on this project involved an "A + B - C" concept, with the "C" component representing the value of the warranty provided by the contractor. The bid package was evaluated as follows:

- Total Labor and Materials – "A"
- Incorporation of selected Performance Related Specifications
- Contract Time – Owner assigned a value of working days and the Contractor bid the number of working days to completion at an owner assigned rate – "B"
- The owner assigned a value for each year of warranty from 5 - 10 years. The contractor had the option to bid extended year(s) of warranty for his product.
- Low bid was evaluated on the basis of "A + B – C"

Warranty Value

Several different scenarios for the determination of the value associated with each year of warranty have been evaluated. One method would be to utilize the cost of a single rehabilitation for the complete job to establish some type of prorated warranty value for various years. It was determined however, that a better methodology would be to utilize the anticipated user cost which would be realized if the need for rehabilitation occurred.

The value of the warranty was determined based on the anticipated user delays cost determined from FHWA DP-115 "Probabilistic Life-Cycle-Cost Analysis" procedures. The value of the warranty was determined to be the user delay cost associated with a single lane closure for 24 hours per day for 30 days during each year of the warranty period. The contractor was required to provide a 5-year warranty and receive no credit for bid evaluation purposes. Thus, the user delay cost at year 5 was deducted from the user delay cost associated with years 6 - 10.

This is illustrated graphically in Figure 4.

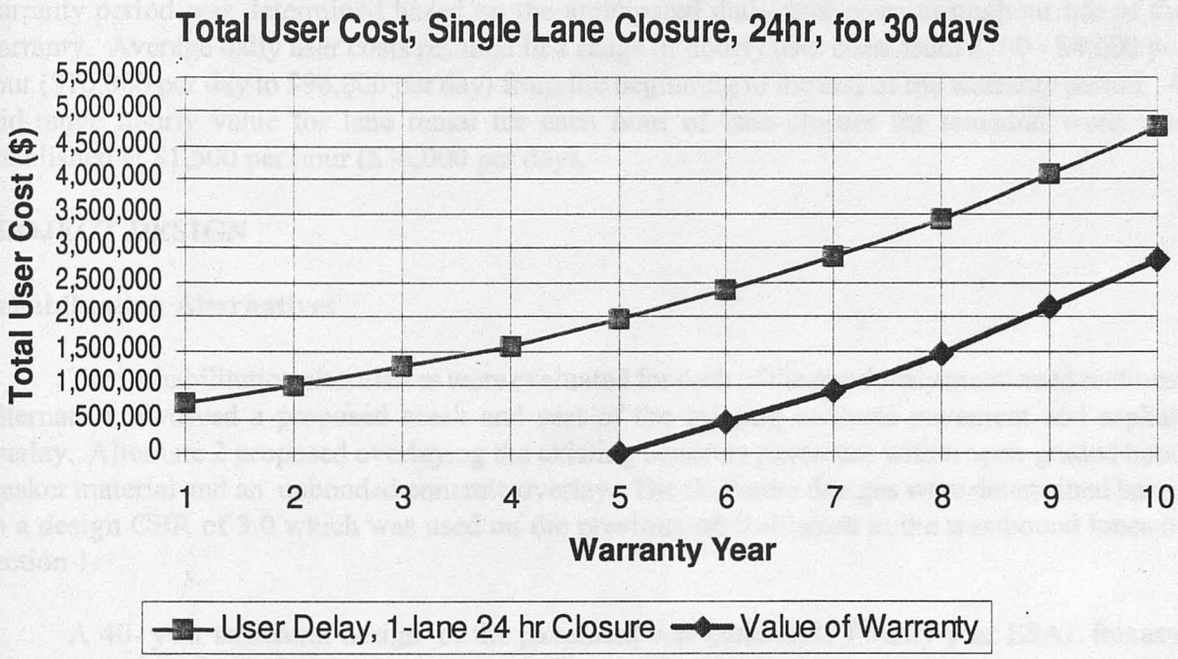

Figure 4. Value of Warranty

The final value associated with each year of extended warranty is as follows:

Year 6	$500,000,
Year 7	$1,000,000,
Year 8	$1,500,000,
Year 9	$2,100,000,
Year 10	$2,900,000.

For example, a contractor providing a 7-year warranty would receive a credit of $1,000,000 toward the evaluation of the bid, while another contractor bidding a 10-year warranty would receive a $2,900,000 credit for bid comparison purposes. The value associated with each working day " the "B" component was estimated using a similar procedure for calculation of user delay assuming the existing six lane typical section would be reduced to four lanes (two lanes in each direction) during initial construction of the project. The "final B value" used in the contract may need to be modified slightly to reflect individual traffic control phases wherein less than two lanes in each direction may be provided for short periods of time. The analysis indicated that the value associated with each individual working day was $25,000. Furthermore, the contractor had the opportunity to receive an incentive of up to 30 days times the value of each working day ($750,000 per this example) for early completion of construction. A disincentive for late completion of construction was to be charged in a similar fashion with the exception that there was no maximum for the number of days which could be applied for disincentive purposes if the contractor exceed the established contract time.

A value associated for lane rental for each hour of lane closure for remedial work during the warranty period was determined based on the anticipated daily user costs throughout life of the warranty. Average daily user costs resulted in a range of hourly user costs from $700 - $4,000 per hour ($16,800 per day to $96,000 per day) from the beginning to the end of the warranty period. A mid-range hourly value for lane rental for each hour of lane closure for remedial work was established at $1,500 per hour ($36,000 per day).

PROJECT DESIGN

Rehabilitation Alternatives

Two rehabilitation alternatives were evaluated for each of the previously mentioned sections. Alternate 1 involved a proposed break and seat of the existing concrete pavement and asphalt overlay. Alternate 2 proposed overlaying the existing concrete pavement with a open-graded bond breaker material and an unbonded concrete overlay. The thickness designs were determined based on a design CBR of 3.0 which was used on the previous rehabilitation in the westbound lanes of Section 1.

A 40- year structural design of the pavement was evaluated. Twenty-year ESAL forcasts were doubled to obtain the 40-year ESAL estimate used in the analysis.

Asphalt Alternative

Thickness designs were developed using the 1993 AASHTO Guide for Design of Pavement Structures and the procedures outlined in Research Report KTRP 87-29 "Pavement Designs Based on Work" published by the Kentucky Transportation Center, University of Kentkcy. The following design parameters were utilized for each design procedure.

Kentucky Procedure UKTRP Report 87-29
- Broken Concrete Modulus – 25, 100, and 250 ksi
- Subgrade CBR – 3.0

1993 AASHTO Procedure
- Broken Concrete Layer Coefficient – 0.18 and 0.21
- Asphalt Surface Layer Coefficient – 0.44
- Asphalt Base Layer Coefficient – 0.40
- Effective Layer Coefficient of Existing DGA – 0.10
- Initial Serviceability – 4.5
- Terminal Serviceability – 3.0
- Overall Deviation – 0.49
- Reliability – 95%
- Subgrade CBR – 3.0, M_r = 4,500

Using these parameters, thickness designs were developed for design ESALs from 10,000,000 - 50,000,000. The thickness designs for Section 1 (MP 1.05 - 4.06) are given in Figure 5. The designs for Section 2 (MP 4.06 - 7.15) are given in Figure 6.

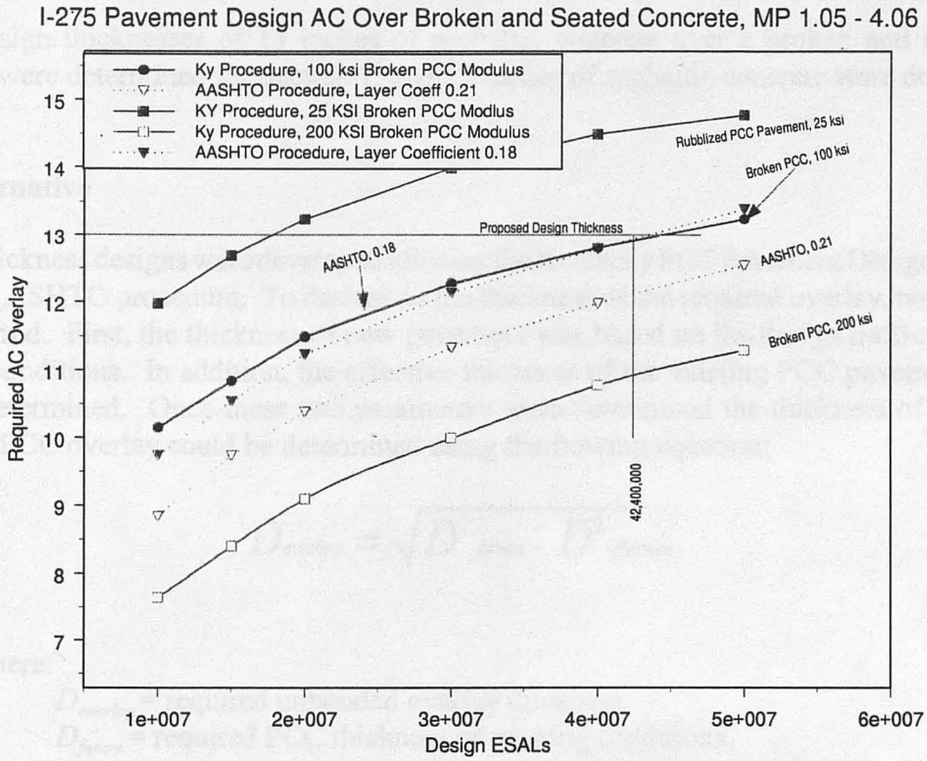

Figure 5. Asphalt Pavement Design, MP 1.05 - 4.06

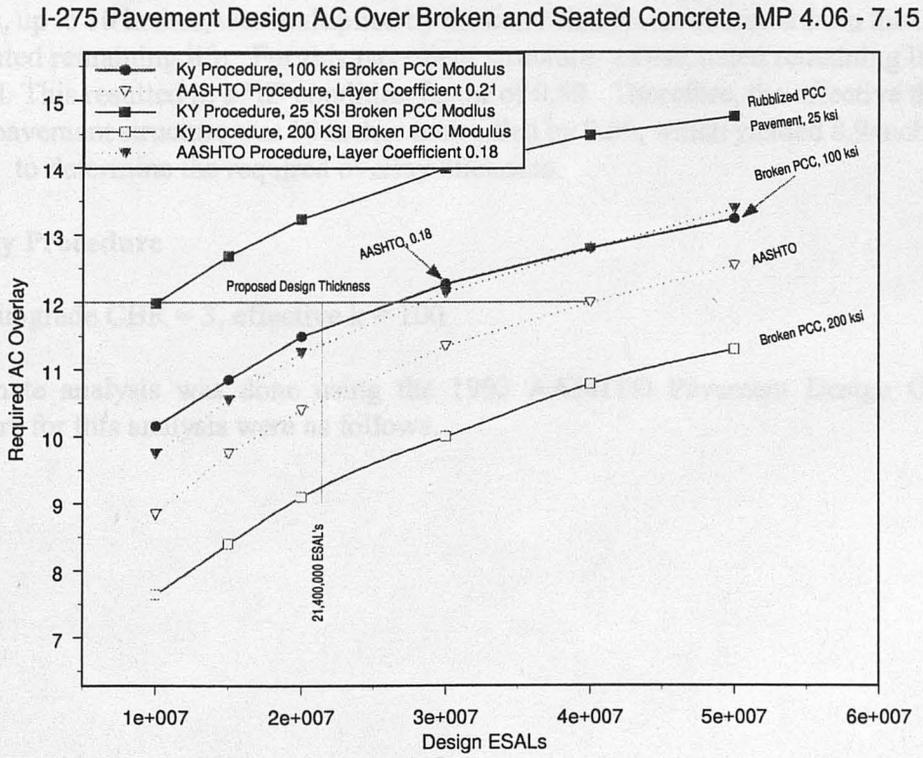

Figure 6. Asphalt Pavement Design, MP 4.06 - 7.15

Design thicknesses of 13 inches of asphaltic concrete over a broken and seated PCC pavement were determined for Section 1, and 12 inches of asphaltic concrete were determined for Section 2.

PCC Alternative

Thickness designs were developed utilizing the Kentucky PCC Pavement Design Catalog and the 1993 AASHTO procedure. To determine the thickness of the required overlay, two parameters were required. First, the thickness of new pavement was based on the design traffic and existing subgrade conditions. In addition, the effective thickness of the existing PCC pavement structure must be determined. Once these two parameters were determined the thickness of the required unbonded PCC overlay could be determined using the flowing equation:

$$D_{overlay} = \sqrt{D^2_{future} - D^2_{effective}} \qquad (1)$$

Where:

$D_{overlay}$ = required unbonded overlay thickness,
D_{future} = required PCC thickness of existing conditions,
$D_{effective}$ = effective thickness of the existing PCC pavement based on condition.

To determine the effective thickness of the existing pavement, the actual pavement thickness was reduced based on the estimated remaining life of the pavement structure. A condition factor was determined based on Section III, Figure 5.2 in the 1993 AASHTO Guide. The actual pavement thickness, up to 10 inches, was multiplied by the condition factor obtained from the Guide based on an estimated remaining life. For this pavement structure, an estimated remaining life of 50% was identified. This resulted in a "d" condition factor of 0.89. Therefore, the effective thickness of the existing pavement structure was 10 inches multiplied by 0.89, which yielded 8.9 inches. This value was used to determine the required overlay thickness.

Kentucky Procedure

Subgrade CBR = 3, effective k = 100

An alternate analysis was done using the 1993 AASHTO Pavement Design Guide, and the parameters for this analysis were as follows.

1993 AASHTO Procedure

PCC Modulus of Rupture – 600 psi
PCC Modulus of Elasticity – 3,500,000 psi
Load Transfer Coefficient – 2.7
Overall Deviation – 0.39
Reliability – 95%
Initial Serviceability – 4.5

Terminal Serviceability — 3.0
Modulus of Subgrade Reaction – 100 pci

Using these parameters, thickness designs have been developed for design ESALs from 10,000,000 - 50,000,000. The thickness designs for Section 1 (MP 1.05 - 4.06) are given in Figure 7. The designs for Section 2 (MP 4.06 - 7.15) are given in Figure 8.

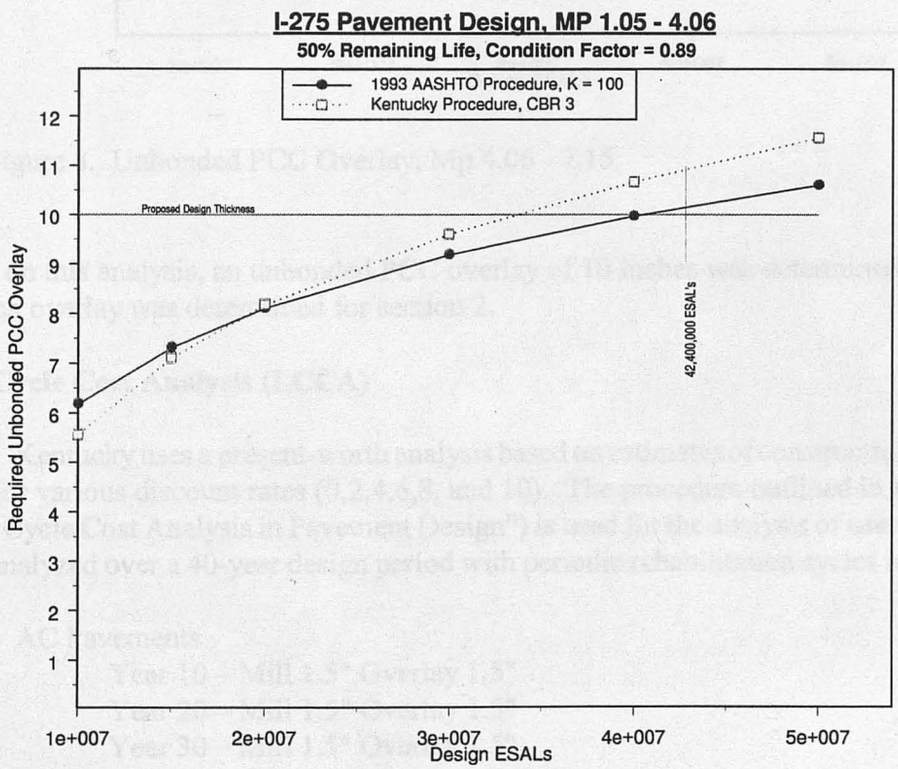

Figure 7. Unbonded PCC Overlay, Mp 1.05 - 4.06

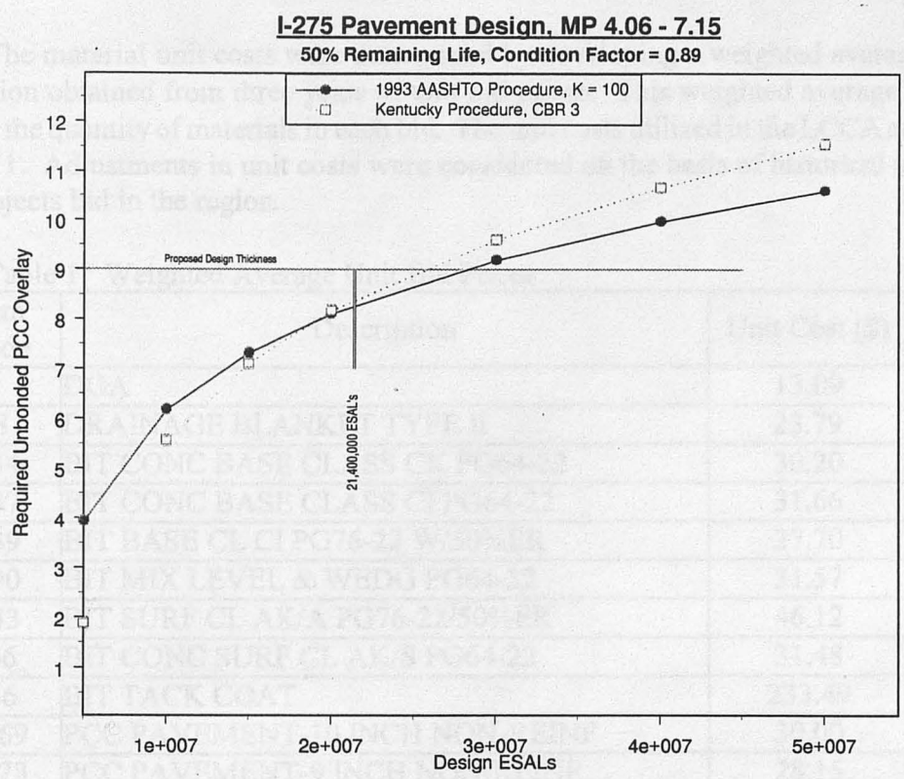

Figure 8. Unbonded PCC Overlay, Mp 4.06 - 7.15

Based on this analysis, an unbonded PCC overlay of 10 inches was determined for Section 1, and a 9-inch overlay was determined for section 2.

Life Cycle Cost Analysis (LCCA)

Kentucky uses a present-worth analysis based on estimates of construction and rehabilitation costs for various discount rates (0,2,4,6,8, and 10). The procedure outlined in FHWA-SA-98-079 ("Life Cycle Cost Analysis in Pavement Design") is used for the analysis of user costs. Alternatives were analyzed over a 40-year design period with periodic rehabilitation cycles included as follows:

AC Pavements

Year 10 – Mill 1.5" Overlay 1.5"
Year 20 – Mill 1.5" Overlay 1.5"
Year 30 – Mill 1.5" Overlay 1.5"

PCC Pavements

Year 15 – Clean and Reseal Joints
Year 30 – Clean and Reseal Joints

At year 40, a salvage value for each alternative is determined. This salvage value was determined by taking the total quantity of all paving from the rehabilitation and the original structure

and assigning a value equal to that of aggregate base.

The material unit costs were determined by developing a weighted average cost based on information obtained from three years of unit bid prices. This weighted average was determined based on the quantity of materials in each bid. The unit costs utilized in the LCCA analysis are given in Table 1. Adjustments in unit costs were considered on the basis of historical unit cost data for other projects bid in the region.

Table 1. Weighted Average Unit Bid Prices

Item Code	Description	Unit Cost ($)	Units
1	DGA	13.09	TON
18	DRAINAGE BLANKET TYPE II	23.79	TON
134	BIT CONC BASE CLASS CK PG64-22	30.20	TON
137	BIT CONC BASE CLASS CI PG64-22	31.66	TON
139	BIT BASE CL CI PG76-22 W/50%ER	37.70	TON
190	BIT MIX LEVEL & WEDG PG64-22	31.57	TON
243	BIT SURF CL AK/A PG76-22/50%ER	46.12	TON
246	BIT CONC SURF CL AK/S PG64-22	31.48	TON
356	BIT TACK COAT	233.49	TON
2069	PCC PAVEMENT-10 INCH NON-REINF	30.00	SQ YD
2073	PCC PAVEMENT-9 INCH NON-REINF	28.15	SQ YD
2107	BREAKING & SEATING PVMNT.	1.00	SQ YD
2115	SAW-CLEAN-RESEAL TVERSE JOINT	2.35	LIN FT
2116	SAW-CLEAN-RESEAL LONGIT JOINT	1.75	LIN FT
2677	PAVEMENT MILLING	17.62	TON

User Cost Analysis

As was previously stated, the user costs for the project were evaluated based on procedures outlined in Research Report FHWA-SA-98-079. Calculated user delay cost were based on the reduction in capacity in the construction work zone. Separate analyses of user costs were conducted for each design section due to the differences in traffic volumes. User costs were calculated both for the initial construction phase of the project and for rehabilitation at years 10,15, 20, and 30. These user costs were based on current and projected traffic levels in each of the rehabilitation years. Daily user costs and average length of queue were determined at each of these time interval. During the initial construction and each of the subsequent rehabilitations, the work zone parameters, (such as number of lanes, working hours, and etc.) were identified.

The following scenarios were used for analysis:

Initial Construction
2 lanes open, 24 hours per day

Rehabilitation Years 10, 15, and 20
2 lanes open, 6 p.m. - 6 a.m.
3 lanes open, 6 a.m. - 6 p.m.

Rehabilitation Year 30
2 lanes open 7 p.m. - 6 a.m.
3 lanes open 6 a.m. - 7 p.m.

Workzone capacity: 1,650 veh./hr./lane
Queue Dissipation: 1,800 veh./hr./lane.

From this analysis, the expected user costs for both sections of the project were determined and are given in Table 2.

Table 2. User Cost Analysis

Section 1 MP 1.05-4.06						
Activity	Improvement Year	Project Length (days)	Traffic Vol. One Way	1-Direction Daily User Cost ($)	1-Direction Project User Cost ($)	Avg. Queue Length (mi)
Initial Construciton	2000	120	43,000	16,186	1,942,377	0.8
Year 10 Rehabilitation	2010	30	52,417	5,318	159,547	0.3
Year 15 Rehabilitation	2015	30	57,872	10,463	313,888	0.7
Year 20 Rehabilitation	2020	30	63,896	28,518	855,533	1.8
Year 30 Rehabilitation	2030	30	77,889	27,634	829,006	1.0
Section 2 MP 4.06 - 7.15						
Initial Construction	2000	120	26,500	5,179	621,504	0.0
Year 10 Rehabilitation	2010	30	32,303	2,584	77,534	0.0
Year 15 Rehabilitation	2015	30	35,666	2,853	85,604	0.0
Year 20 Rehabilitation	2020	30	39,378	3,150	94,514	0.0
Year 30 Rehabilitation	2030	30	48,001	2,808	84,233	0.0

The summary of the LCCA is contained in Table 3 for Section 1 and Table 4 for Section 2 and in Figures 9 and 10.

Table 3. LCCA summary MP 1.05 - 4.06

Alternate 1 13" AC Overlay		Discount Rate											
		0		2		4		6		8		10	
	Improvement	Cost ($)		Cost ($)		Cost ($)		Cost ($)		Cost ($)		Cost ($)	
	Year	Agency	User	Agency	User	Agency	User	Agency	User	Agency	User	Agency	User
Initial Construction Alt 1	2000	2,241,879	1,942,377	2,241,879	1,942,377	2,241,879	1,942,377	2,241,879	1,942,377	2,241,879	1,942,377	2,241,879	1,942,377
Rehabilitation #1	2010	334,292	159,547	274,236	130,884	225,836	107,784	186,667	89,090	154,842	73,901	128,884	61,512
Rehabilitation #2	2020	334,292	855,533	224,969	575,749	152,567	390,454	104,234	266,759	71,722	183,553	49,690	127,170
Rehabilitation #3	2030	334,292	829,006	184,553	457,670	103,069	255,598	58,204	144,338	33,221	82,384	19,158	47,509
Salvage	2040	-2,023,762		-916,542		-421,527		-196,755		-93,156		-44,715	
Alt-1 Subtotal		1,220,995	3,786,464	2,009,095	3,106,681	2,301,823	2,696,214	2,394,230	2,442,565	2,408,509	2,282,216	2,394,897	2,178,568
Alt.-1 Total NPV			5,007,458		5,115,776		4,998,037		4,836,795		4,690,725		4,573,465

Alternate 2 10" PCC Overlay		Discount Rate											
		0		2		4		6		8		10	
	Improvement	Cost ($)		Cost ($)		Cost ($)		Cost ($)		Cost ($)		Cost ($)	
	Year	Agency	User	Agency	User	Agency	User	Agency	User	Agency	User	Agency	User
Initial Construction Alt 2	2000	2,754,752	1,942,377	2,754,752	1,942,377	2,754,752	1,942,377	2,754,752	1,942,377	2,754,752	1,942,377	2,754,752	1,942,377
Rehabilitation #1	2015	145,260	313,888	107,930	233,223	80,658	174,291	60,612	130,975	45,792	98,951	34,774	75,142
Rehabilitation #2	2030	145,260	829,006	80,194	457,670	44,786	255,598	25,291	144,338	14,436	82,384	8,325	47,509
Salvage	2040	-1,834,075		-830,635		-382,018		-178,313		-84,424		-40,524	
Alt-2 Subtotal		1,211,197	3,085,272	2,112,241	2,633,271	2,498,179	2,372,266	2,662,342	2,217,690	2,730,555	2,123,712	2,757,327	2,065,029
Alt.-2 Total NPV			4,296,469		4,745,512		4,870,445		4,880,033		4,854,268		4,822,356

Table 4 LCCA Summary, MP 4.06 - 7.15

Alternate 1 12" AC Overlay		Discount Rate											
		0		2		4		6		8		10	
	Improvement Year	Cost ($)		Cost ($)		Cost ($)		Cost ($)		Cost ($)		Cost ($)	
		Agency	User	Agency	User	Agency	User	Agency	User	Agency	User	Agency	User
Initial Construction Alt 1	2000	4,315,106	1,243,009	4,315,106	1,243,009	4,315,106	1,243,009	4,315,106	1,243,009	4,315,106	1,243,009	4,315,106	1,243,009
Rehabilitation #1	2010	686,354	155,068	563,050	127,210	463,676	104,758	383,257	86,589	317,915	71,826	264,619	59,785
Rehabilitation #2	2020	686,354	189,027	461,897	127,210	313,243	86,269	214,009	58,940	147,256	40,555	102,022	28,098
Rehabilitation #3	2030	686,354	146,687	378,916	80,981	211,616	45,226	119,501	25,540	68,208	14,577	39,334	8,406
Salvage	2040	-4,017,626		-1,819,544		-836,827		-390,602		-184,935		-88,769	
Alt-1 Subtotal		2,356,543	1,733,790	3,899,425	1,578,410	4,466,814	1,479,263	4,641,270	1,414,077	4,663,550	1,369,968	4,632,312	1,339,298
Alt.-1 Total NPV			4,090,334		5,477,834		5,946,077		6,055,347		6,033,518		5,971,611

Alternate 2 9" PCC Overlay		Discount Rate											
		0		2		4		6		8		10	
	Improvement Year	Cost ($)		Cost ($)		Cost ($)		Cost ($)		Cost ($)		Cost ($)	
		Agency	User	Agency	User	Agency	User	Agency	User	Agency	User	Agency	User
Initial Construction Alt 2	2000	5,307,153	1,243,009	5,307,153	1,243,009	5,307,153	1,243,009	5,307,153	1,243,009	5,307,153	1,243,009	5,307,153	1,243,009
Rehabilitation #1	2015	298,242	171,208	221,598	127,210	165,603	95,066	124,446	71,439	94,018	53,972	71,397	40,986
Rehabilitation #2	2030	298,242	146,687	164,651	80,981	91,954	45,226	51,927	25,540	29,638	14,577	17,092	8,406
Salvage	2040	-3,626,825		-1,642,554		-755,428		-352,608		-166,946		-80,134	
Alt-2 Subtotal		2,276,812	1,560,903	4,050,848	1,451,200	4,809,282	1,383,300	5,130,918	1,339,987	5,263,864	1,311,558	5,315,507	1,292,401
Alt.-2 Total NPV			3,837,715		5,502,048		6,192,582		6,470,906		6,575,422		6,607,908

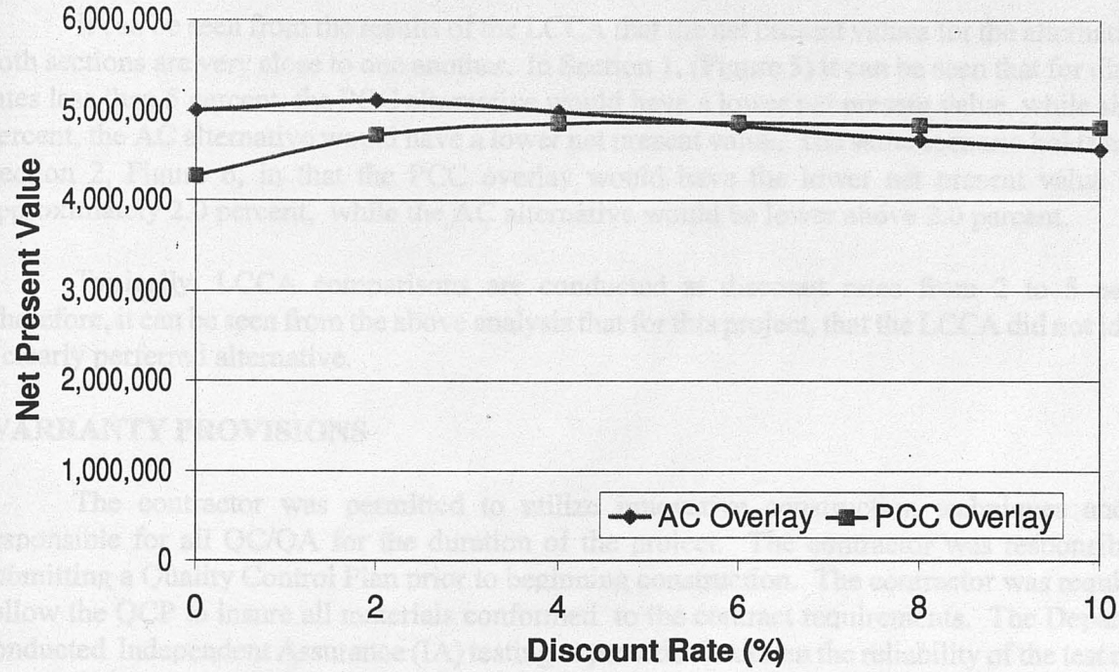

Figure 9. Net Present Value, MP 1.05 - 4.06

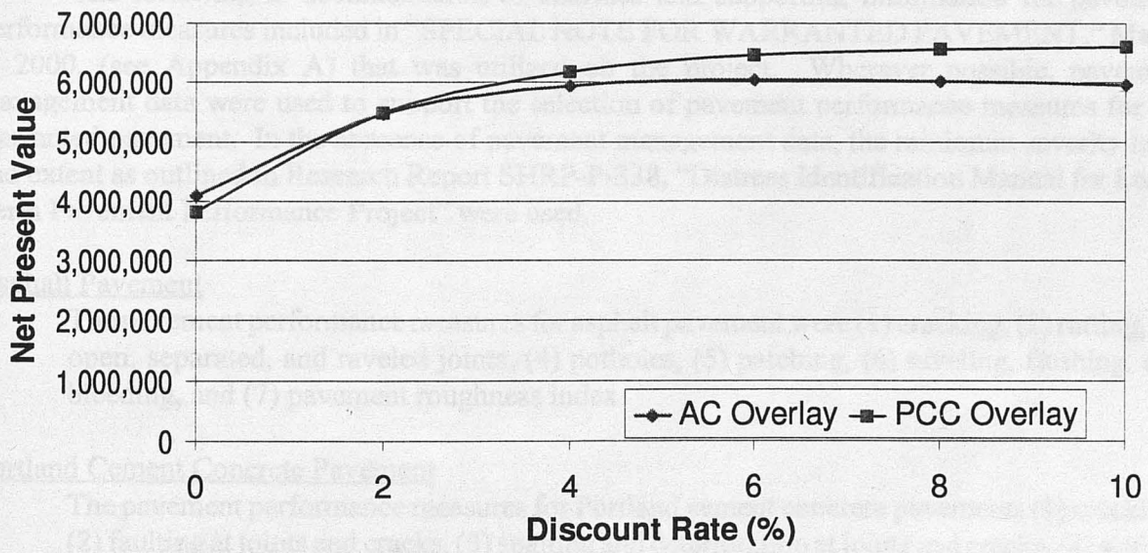

Figure 10. Net Present Value, MP 4.06 - 7.15

It can be seen from the results of the LCCA that the net present values for the alternatives in both sections are very close to one another. In Section 1, (Figure 5) it can be seen that for discount rates less than 5 percent, the PCC alternative would have a lower net present value, while above 5 percent, the AC alternative would have a lower net present value. The same scenario holds true for Section 2, Figure 6, in that the PCC overlay would have the lower net present value below approximately 2.0 percent, while the AC alternative would be lower above 2.0 percent.

Typically, LCCA comparisons are conducted at discount rates from 2 to 5 percent. Therefore, it can be seen from the above analysis that for this project, that the LCCA did not identify a clearly perferred alternative.

WARRANTY PROVISIONS

The contractor was permitted to utilize innovative construction techniques and was responsible for all QC/QA for the duration of the project. The contractor was responsible for submitting a Quality Control Plan prior to beginning construction. The contractor was required to follow the QCP to insure all materials conformed to the contract requirements. The Department conducted Independent Assurance (IA) testing to provide checks on the reliability of the test results obtained in sampling and testing.

Special Note of Warranty Pavements

The following is documentation of analyses and supporting information for pavement performance measures included in "SPECIAL NOTE FOR WARRANTED PAVEMENT," March 3, 2000, (see Appendix A) that was utilized on the project. Wherever possible, pavement management data were used to support the selection of pavement performance measures for the warranted pavement. In the abscense of pavement management data, the minimum severity level and extent as outlined in Research Report SHRP-P-338, "Distress Identification Manual for Long-Term Pavement Performance Project" were used.

Asphalt Pavement

The pavement performance measures for asphalt pavement were (1) cracking, (2) rutting, (3) open, separated, and raveled joints, (4) potholes, (5) patching, (6) raveling, flushing, and bleeding, and (7) pavement roughness index.

Portland Cement Concrete Pavement

The pavement performance measures for Portland cement concrete pavements (1) cracking, (2) faulting at joints and cracks, (3) spalling and deterioration at joints and cracks, (4) scaling and map cracking, (5) blowups and shattered panels, (6) patching, (7) popouts, and (8) pavement roughness index.

Pavement rideability data for (1) broken and seated pavements constructed during the past ten years, (2) portland cement concrete pavements constructed during the past years, and, (3) diamond ground portland cement concrete pavements constructed during the past ten years were used to establish historical trends in pavement smoothness for the alternative rehabilitation strategies considered for this project. A plot of this data is given in Figure 11. These data were analyzed by developing regression equations for each individual project. Cumulative distribution plots of the initial rideability indices and slopes of the regression lines are given in Figures 12 and 13.

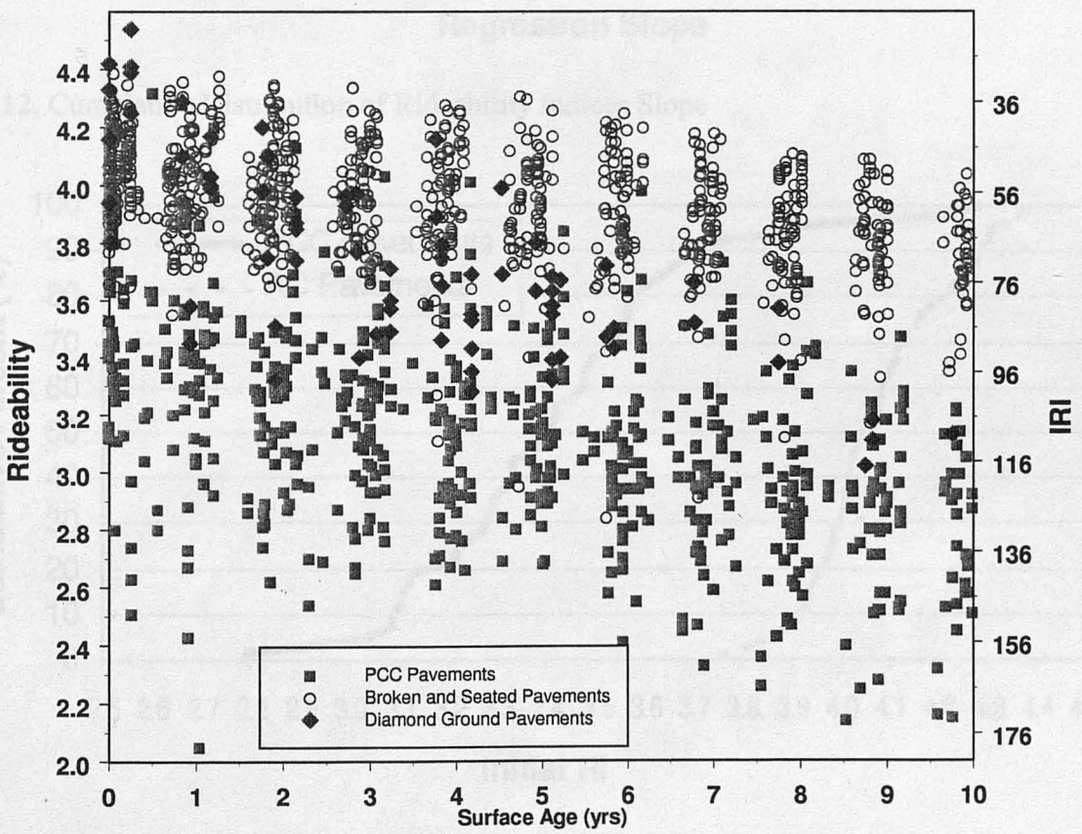

Figure 11. Rideability Comparison

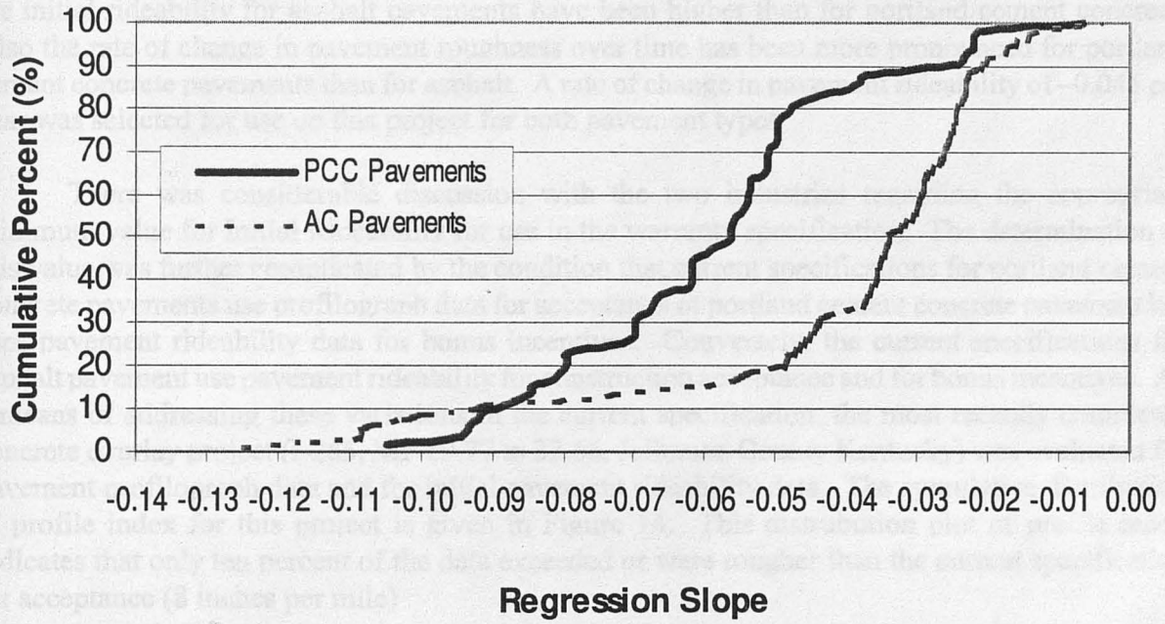

Figure 12. Cumulative Distribution of Rideability Indices Slope

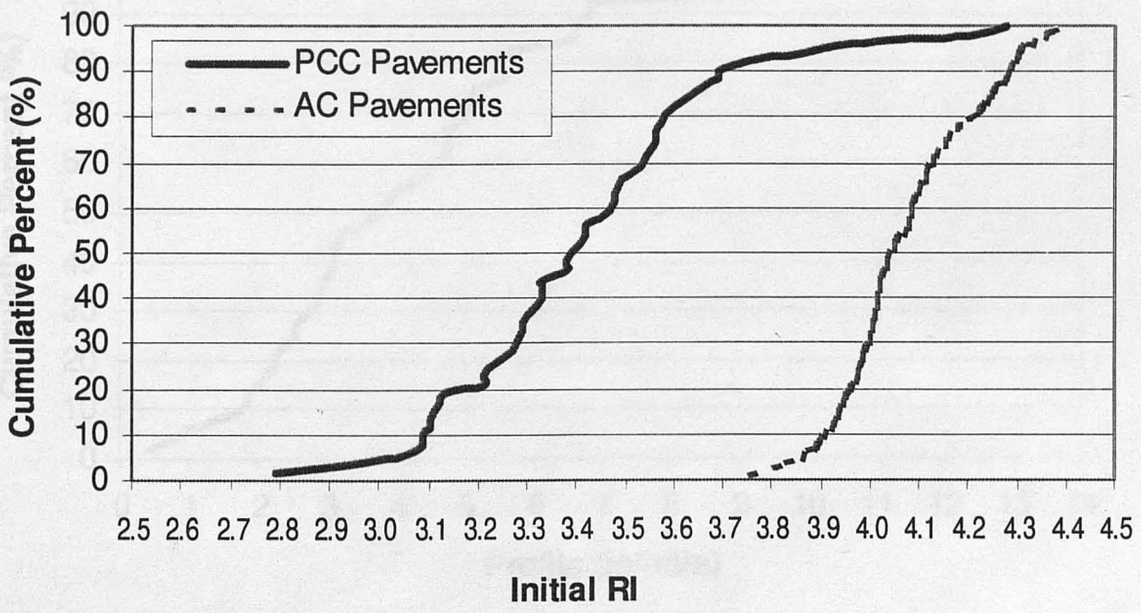

Figure 13. Cumulative Distribution of Initial RI

A plot of profile index versus rideability for I-265 in Jefferson County is given in Figure 15. The regression analysis of pavement rideability on profile index indicates that an initial pavement rideability of 3.4 would typically be associated with 8 inches per mile profile index.

After detailed review of the historical data in Figure 11, It was the perspective of the project team that a rideability index of 3.10 for pcc pavements and 3.45 for asphalt pavements were the minimum acceptable levels of performance a the 10 year interval for the respective pavement types. Using the minimum acceptable levels of pavement rideability at the 10 year interval as discussed earlier and the constant rate of change in pavement rideability with time of -0.45 an initial threshold for pavement rideability of 3.55 for concrete pavements was determined, a similar value for asphalt pavements was determined to be 3.90

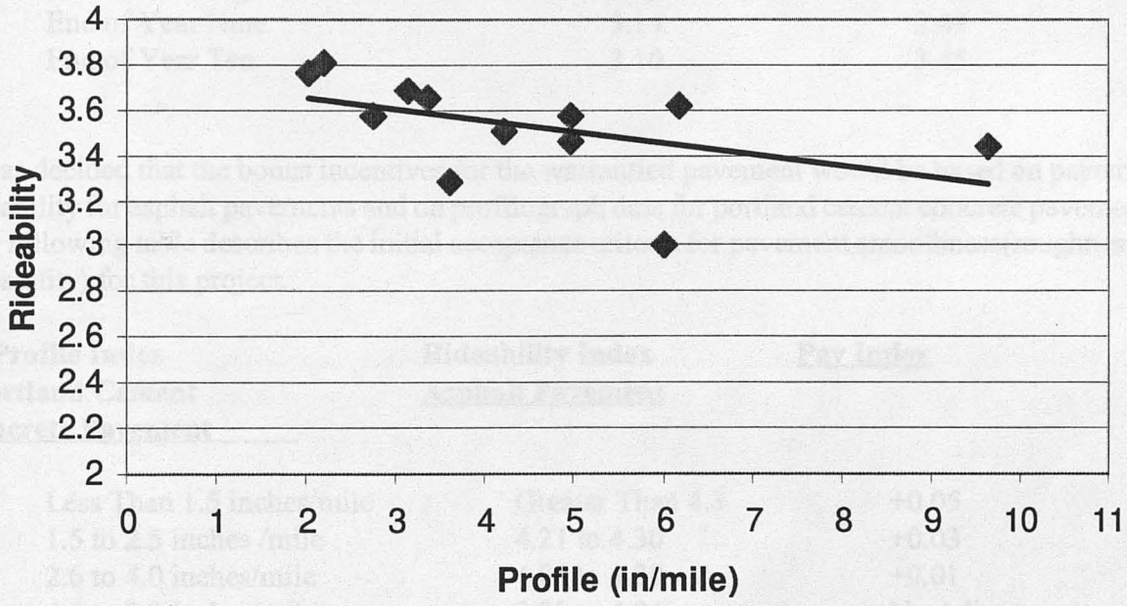

Figure 15. Relationship Between Pavement Rideability and Pavement Profie, I-265, MP 29.77 - 32.66.

This results in the following table of thresholds for pavement rideability over time:

Pavement Rideability Thresholds	**Portland Cement Concrete**	**Asphalt**
Initial Rideability Index	3.55	3.90
End of Year One	3.50	3.85
End of Year Two	3.46	3.81
End of Year Three	3.41	3.76
End of Year Four	3.37	3.72
End of Year Five	3.32	3.67
End of Year Six	3.28	3.63
End of Year Seven	3.23	3.58
End of Year Eight	3.19	3.54
End of Year Nine	3.14	3.49
End of Year Ten	3.10	3.45

It was decided that the bonus incentives for the warrantied pavement would be based on pavement rideability for asphalt pavements and on profilograph data for portland cement concrete pavements. The following table describes the initial acceptance criteria for pavement smoothness(roughness or rideability) for this project.

Profile Index Portland Cement Concrete Pavement	**Rideability Index Asphalt Pavement**	**Pay Index**
Less Than 1.5 inches/mile	Greater Than 4.3	+0.05
1.5 to 2.5 inches /mile	4.21 to 4.30	+0.03
2.6 to 4.0 inches/mile	4.05 to 4.20	+0.01
4.1 to 8.0 inches/mile	3.90 to 4.04	No Adjustment
Greater Than 8.0 inches/mile	Less than 3.90	Remedial Work Required

Pavement rutting data were analyzed for asphalt pavements constructed over broken and seated portland cement concrete pavements. A cumulative distribution plot of historical broken and seated pavements at 5 and 10 years is given in Figure 16.

It was ultimately determined that a maximum threshold of 1/4 inch rutting measured any time during the first five years of the project would be required in the warranty specification. This corresponds to an 80th percentile value for rutting. That is, for the rutting measured for this data set, only 20 percent of the pavements showed rutting greater than 1/4 inch during the first five years of service. A threshold of 3/8 inch rutting was determined for the threshold for 10 years. This corresponded to a 70th percentile value (30 percent of the data measured during the ten-year service life of these pavements showed rutting greater than 3/8 inch).

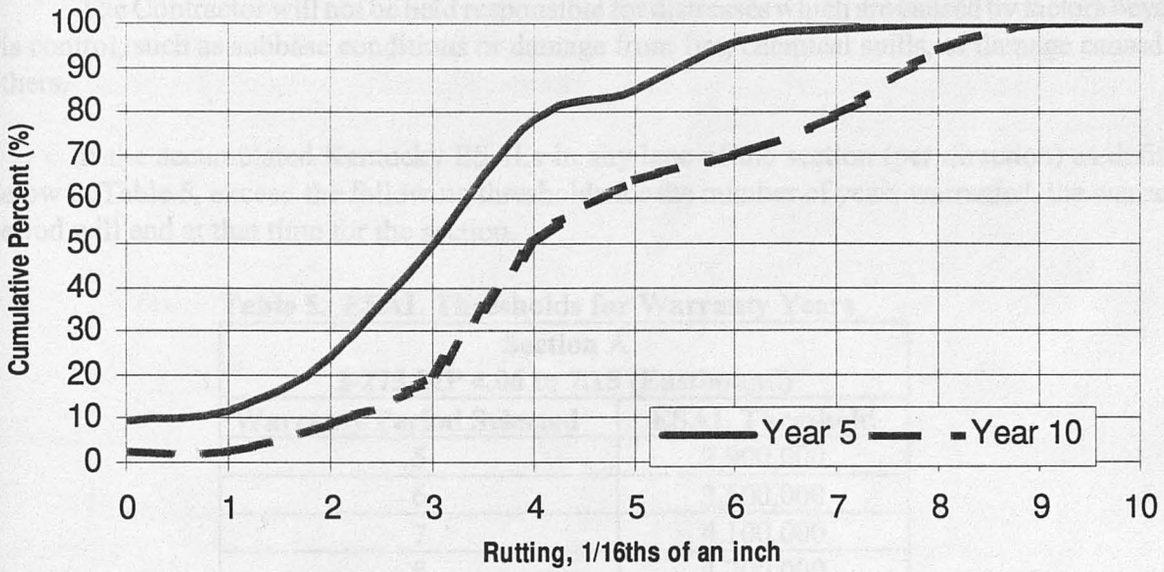

Figure 16. Cummulative Distribution of Pavement Rutting

Performance Evaluation

Performance evaluations and traffic monitoring will be in accordance with the Special Note for Warranted Pavements which is included in Appendix A.

Warranty Exemptions

The Contractor will not be held responsible for distresses which are caused by factors beyond his control, such as subbase conditions or damage from fire, chemical spills, or damage caused by others.

If the accumulated Kentucky ESALs in any lane of the section (per direction) as defined below in Table 5, exceed the following thresholds for the number of years warranted, the warranty period will end at that time for the section.

Table 5. ESAL Thresholds for Warranty Years

Section A I-275 MP 4.06 to 7.15 (Eastbound)	
Warranty Period Selected	**ESAL Threshold**
5	2,900,000
6	3,500,000
7	4,100,000
8	4,700,000
9	5,300,000
10	5,900,000
Section A I-275 MP 4.06 to 7.15 (Westbound)	
Warranty Period Selected	**ESAL Threshold**
5	2,900,000
6	3,500,000
7	4,100,000
8	4,700,000
9	5,300,000
10	5,900,000
Section B I-275 MP 1.06 to 4.06 (Eastbound)	
Warranty Period Selected	**ESAL Threshold**
5	5,900,000
6	7,100,000
7	8,200,000
8	9,400,000
9	10,600,000
10	11,800,000

Analysis of Bids

Three contractors submitted bids for this project. The successful bidder was The W. L. Harper Company. The W. L. Harper Companry and Baker Concrete Construction bid portland cement pavement and Eaton Asphalt Paving bid asphaltic concrete pavement. The contract was an A+B-C type of contract, a copy of the special note for A+B-C bidding is included in Appendix B. The A component was the cost of labor and materials; the B component was the number of calendar days to construct the project; the C component was the length of warranty in years. The following lists the A component of the three bidders:

The W. L Harper Company	$23,128,278,		
Eaton Asphalt Paving	$25,575,878,	**Difference between #1 and #2**	-$2,447,600
Baker Concrete Construction	$26,295,570.	**Difference between #1 and #3**	-$3,167,292

There were a total of 244 individual bid items on the project. A copy of the unit bid tabulations is given in Appendix C. The three contractors bid reasonably close on most of the individual items, however, there were a few items where there was a large disparity between the bids. Those are listed in Table 6. An examination of the items listed in Table 6. indicates that the successful bidder (The W. L. Harper Co.) underbid his competitors by over $1,500,000 non-pavement items alone. Mos of that difference was related to bid items #68, #69, #74, #163, and #164.

Table 7. lists the bids by contractor for warrantied and non-warrantied pavements. The difference between the lowest bid (The W. L. Harper Co.) and the highest bid for warrantied pavements was approximately $600,000. The difference between the lowest and highest bids for non-warrantied pavements was approximately $800,000. The succusfull bidder was between the lowest and highest bidders for non-warrantied pavements. The difference between the lowest and highest bidders for all pavement items was approximately $1,400,000. The difference between the pavement items of the succusfull bidder and the second bidder (AC) was only $26,238. This is only 0.3 percent difference in cost between the asphalt pavement and the concrete pavement and only 0.11 percent of the total bid of the successful bidder. In summary, it appears that the cost between the two pavement alternates for this project was insignificant, and the successful bidder underbid his competitors on mostly non-pavement items.

The contractors also bid the number of days necessary to complete the project (Component B). The W. L. Harper Co. bid 380 days and the other two bidders bid 450 days each. At $25,000 per day, the succusfull bidder underbid the competition by $1,750,000.

Component C was the warranty part of the bidding process. All three contractors bid a 10-year warranty. Therefore, the length of the warranty had no influence on the outcome of the bidding for the project.

To further demonstrate the pavement type selection was to close to call by the agency. The life cycle cost analysis in Figures 9 and 10 have been reconstructed using actual bid costs. The results of this analysis is given in Figure 17 and 18 for each of the design sections. It may be seen from these figures that the initial life cycle cost analysis and the subsequent analysis conducted using the actual unit bid tabulations are nearly identical, this further illustrates that no clearly preferred alternative could be determined.

The data presented in this report has demonstrated that the alternative pavement designs used should each carry the same amount of ESALs prior to structural fatigue. Warranties were used to address the functional distress for one pavement type versus another. Since all bidders bid a 10-year warranty, it would indicate that the distress types were equivalent in the eyes of the contractors. Only time and continued distress monitoring will address this issue.

A subsequent report detailing the initial distress evaluation and any changes that were made to the contract during construction will be forthcoming.

Table 6. Comparison of Selected Bid Items by Contractor

Bid Item Number	*Bid Item Name*	*No. of Units*	*Contractor #1*	*Contractor #2*	*Contractor #3*
			Total Bid-$	Total Bid-$	Total Bid-$
#29	Jack and Support Bridge Spans	1	120,000	52,000	41,000
#68	Concrete Barrier Wall	17,000 Lin. Ft.	510,000	901,680	765,000
#69	Relocate Temp. Conc. Median Barrier	82,920 Lin. Ft.	41,460	276,124	165,840
#74	Special Embankment	39,162 Cu. Yd.	19,581	285,099	274,134
#89-#90	Clearing and Grubbing	2	52,000	45,240	192,000
#97-#98	Traffic Control	2	165,000	138,151	430,000
#104-#105	Staking	2	225,500	135,200	240,000
#127	Remove Existing Superstructure	1	146,000	43,680	50,000
#129-#161	Crossovers, Slip and Temporary Ramps	33	208,900	536,120	313,800
#163-#164	Traffic Monitoring	2	606,000	1,285,440	1,066,000

Table 7. Comparison of Pavement Bid Items by Contractor

Pavement Type	*Contractor #1*	*Contractor #2*	*Contractor #3*
Warrantied	$5,354,769	$5,597,413	$5,958,934
Non-Warrantied	$3,404,137	$3,135,255	$4,210,172
Totals	$8,758,906	$8,732,668	$10,169,106

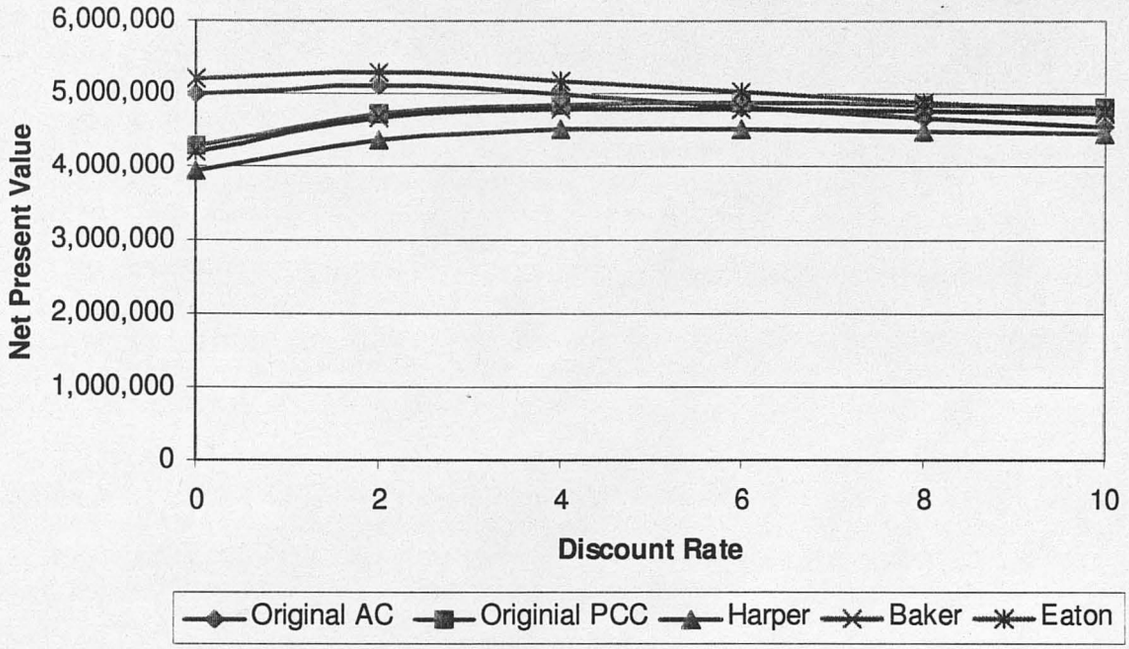

Figure 17. As Bid Life Cycle Cost Analysis MP 1.05 - 4.06

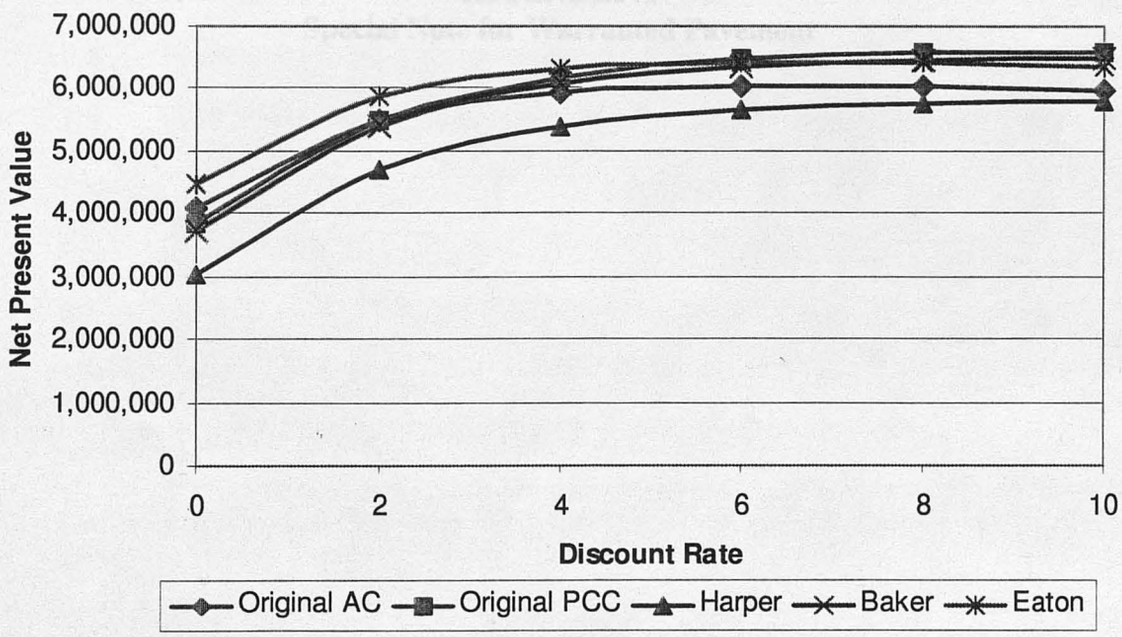

Figure 18. As Bid Life Cycle Cost Analysis, MP 4.06 - 7.15

APPENDIX A
Special Note for Warranted Pavement

SPECIAL NOTE FOR WARRANTED PAVEMENT

1.0 DESCRIPTION. Retain responsibility for the warranted pavement for a period of 5 years or the number of years chosen in the bid proposal, whichever is greater, after the date all pavement is complete and open to unrestricted traffic. The provisions of the warranty work shall apply to all mainline pavement, including the shoulder joint. The warranty will not apply to the shoulders, ramps and acceleration lanes.

2.0 MATERIALS AND EQUIPMENT. Unless otherwise identified by this note or permitted by the Engineer, ensure all materials and equipment meet the requirements of the Standard Specifications for Road and Bridge Construction. The Contractor may furnish materials and utilize equipment that equal or exceed the requirements of the Standard Specifications by obtaining approval through the Quality Control Plan (QCP).

2.1 Aggregates for Asphalt Mixtures. As a minimum, conform to the aggregate requirements listed in AASHTO MP-2. Additionally, provide aggregates conforming to Subsections 804.04 and 805.03 for other requirements not specified in AASHTO MP-2.

For surface courses, excluding shoulders, ensure the aggregates are a Type A from a Class A Polish-Resistant Source from the Department's List of Approved Materials.

2.2 Binder for Asphalt Mixtures. Conform to Section 806. As a minimum for all mainline and ramp pavement, use a PG 76-22 binder in the surface and top base course. As a minimum for all other pavement, use a PG 64-22.

2.3 Tie Bars. Use a minimum diameter of No. 5 and a minimum grade of 60.

2.4 Dowels. Use a minimum grade of 60 with a minimum diameter of 1 1/4 inches.

2.5 Monument Pins. Provide monument disks stamped as identified in the Plans.

2.6 Traffic Monitoring Equipment. Provide vehicle classification and load cell weigh-in-motion (WIM) equipment as the Contract specifies elsewhere.

3.0 CONSTRUCTION.

3.1 Pavement Structure Design. The Department will provide the structural design used for the roadway design along with the current and projected traffic data and subgrade strength parameters used in structural design calculations. The Department will allow their pavement design thickness to be increased. When electing to increase the pavement design thickness, take responsibility for adjusting all drainage, guardrail, clearance heights, and all other affected items. Obtain prior approval for any structural design modifications in writing from the Engineer.

3.1.1 Allowable Asphalt Structural Design Modifications. The addition of asphalt additives and geosynthetics are examples of allowable modifications within the structural design.

3.1.2 Allowable Concrete Structural Design Modifications. High Performance Concrete and the addition of fiber or mineral admixtures are examples of modifications that may be made to the mix design.

Early entry sawing ("soft-cut") of joints will be allowed. Dowel bar inserters will be allowed. Dowel bar diameter size may be increased; however, dowel bar spacing must remain as the Plans and Standard Drawings specify. Joint spacing may be modified, provided a maximum joint spacing of 20 feet is maintained. Tie-bar spacing may be modified, provided the spacing is between 18 and 30 inches.

3.2 Mix Design.

3.2.1 Asphalt Pavement. Use an established mix design process to develop the JMF.

3.2.2 PCC Pavement. Design and proportion the concrete mixtures according to Subsection 601.03.03 for Class P concrete, or develop a mix design according to American Concrete Institute (ACI) 318 based on a minimum 3,850-psi design compressive strength for a 28-day cure. Another design that is equal or exceeds these designs may be approved through the QCP.

3.3 Quality Control Plan (QCP). The QCP applies to all pavement construction including mainline, shoulders, ramps, and acceleration lanes. Develop and submit a QCP to the Engineer for approval. Maintain and follow the QCP to assure all materials will conform to the Contract requirements. Use the QCP for proposing and obtaining approval for any exceptions to the Standard Specifications and Standard Drawings for pavement related items. Do not start paving operations until the QCP is approved.

Maintain the QCP to reflect the current status of the operations, and provide the Engineer with all revisions prior to initiating the change. Perform all testing according to the appropriate Kentucky Method (KM). The minimum requirements for an acceptable QCP are as follows.

3.3.1 Asphalt Pavement Requirements.

A) **Quality Control Personnel.** Provide documentation in the QCP that the person responsible for the mix design is a qualified mix design technologist (Superpave Mix Design Technologist or equivalent). Provide documentation in the QCP that the personnel responsible for quality control at the plant are qualified plant technologists (Superpave Plant Technologists or equivalent).

B) **Laboratory.** Provide and maintain a laboratory for production quality control testing. Provide the Engineer access to the field laboratory to witness quality control activities, and view quality control results.

Ensure all laboratory testing equipment conforms to the requirements of the test methods identified for the QCP's mix design methodology and required sampling and testing procedures. Maintain a record of all equipment calibration results at the laboratory.

C) **Materials.** Supply sufficient documentation to demonstrate that all materials meet standard quality requirements for the application. Certify to the Department that all products used during production meet the quality requirements the QCP specifies.

D) **Mixing Plant.** Calibrate the mixing plant prior to production of the mix. Include the calibration results of all meters, scales and other measuring or recording devices.

E) **Materials Sampling and Testing.** Include the proposed sampling procedures and size of samples necessary for testing, reporting and controlling as a minimum voids-in-mineral-aggregate (VMA), air voids (AV), asphalt content (AC), and density. List the test methods and minimum frequencies for the production-control tests. Ensure core densities are taken to calibrate nuclear density gages.

F) **Variability.** Identify the quality control parameters and test limits proposed to control the mixture during production.

G) **Records.** Maintain control charts at the laboratory. Include as a minimum VMA, AV, AC, In-place Density, and other quality control properties as identified in the QCP.

H) **Construction.** Identify the construction procedures to be utilized and the control for assuring a quality pavement.

3.3.2 PCC Pavement Contractor Requirements.

A) **Mixing Plant**. Furnish evidence of plant approval by the National Ready Mix Concrete Association, Kentucky Ready Mix Concrete Association (KRMCA), or the Department to the Contractor prior to starting concrete production for the project.

Ensure a laboratory is provided and maintained for production quality control testing. Provide the Engineer access to the laboratory to witness quality control activities, and view quality control results.

Ensure all laboratory testing equipment conforms to the requirements of the test methods identified for the QCP's mix design methodology and required sampling and testing procedures. Maintain a record of all results at the laboratory.

B) **Quality Control Personnel.** Provide documentation in the QCP that concrete technicians that have responsibility for sampling and quality control are ACI Level I Concrete Field Testing Technicians, or equivalent, and KRMCA Level II Concrete Technicians, or equivalent, as appropriate.

Provide documentation in the QCP that the personnel that have the responsibility for the aggregate testing are Kentucky Aggregate Technicians or equivalent.

C) **Sampling and Testing.** Supply sufficient documentation to demonstrate that all materials meet standard quality requirements for the application.

Include the proposed sampling procedures and size of samples necessary for testing, reporting and controlling as a minimum air, slump, temperature, and compressive strength. List the test methods and minimum frequencies for the production-control tests.

Certify to the Department that all products used during concrete production meet the quality requirements the QCP specifies.

D) **Variability.** Identify the quality control parameters and test limits proposed to control the mixture during production.

E) **Records.** Maintain control charts. Include as a minimum air, slump, temperature, compressive strength, equipment calibration, and other quality control properties as identified in the QCP.

F) **Construction.** Identify the construction procedures to be utilized and the control for assuring a quality pavement.

3.3.3 Documentation. Maintain all material certifications, production test reports, quality control charts, test equipment certifications and calibrations, and any other material, design, or production related records. Upon completion of the placement and the opening of the warranted pavement to traffic, provide a copy of all records to the Department.

3.3.4 Acceptance Testing. Take the responsibility for all the materials and mixture testing for the warranted pavement. The Department may sample the mix for informational purposes and for first-hand test results for correlation to the pavement's performance. The sampling will not relieve the Contractor of responsibility for meeting the requirements of the warranty.

3.3.5 Independent Assurance (IA) Program. The Department will conduct IA testing to provide checks on the reliability of the test results obtained in sampling and testing. Include in the QCP an acknowledgment of the IA program and the proposed methods to ensure compliance with the minimum frequencies.

3.4 Vehicle Classification and Weigh-In-Motion (WIM) Detectors. Install WIM in the 2 outside lanes and classifiers in all 3 lanes. Monitor, and maintain vehicle classification and WIM equipment for the duration of the pavement warranty. Locate the equipment at the approximate location established on the Pavement Evaluation Section Location Plan as the Engineer directs. Provide for remote access (telephone download) to data collection equipment for vehicle classification and weigh-in-motion data for ready access by the Department or designated representatives. Retain responsibility for power and phone service for the life of the warranty.

3.4.1 Traffic Data Collection. Provide a QC plan for monitoring and maintaining the equipment. Department approval of this plan is not required prior to paving; however, time will not accrue against the warranty period prior to its approval.

3.4.2 Traffic Data and Calculations. Starting when the Warranty goes into effect, collect and submit traffic volume data, vehicle classification data, and truck weight data (unprocessed) to the Department on a quarterly basis (as a minimum) for the Department's calculation of the equivalent single axle loads (ESALs). The Department will make periodic evaluations of the traffic data system.

3.5 Warranty. Starting after all warranted pavement is complete and open to unrestricted traffic, the Warranty Bond will be in effect for the number of warranted years bid or until the threshold ESALs are achieved, whichever occurs first. The Engineer will determine the date that the pavement is complete and open to unrestricted traffic. The warranty bond must be properly executed by a surety company satisfactory to the Department, be payable to the Kentucky State Treasurer, and submitted prior to the start of the warranty period. One-year renewable warranty bonds are acceptable; however, proof of renewal is required. If proof of renewal is not received within 30 days prior to the bond's expiration, the Contract will be considered in default and the full amount of the bond will be forfeited to the Department.

The warranty bond is $2,900,000.00 for the warranted pavement. The bond is intended to ensure completion of all required warranty work, including payments for all labor, equipment, materials, and lane rental needed to remediate any warranted pavement distresses. Upon the final acceptance of the project, the contractual obligations are satisfied as long as the pavement continues to meet or exceed the warranted values as defined herein.

Perform all warranty work according to this Special Note. At the end of the warranty period, the Department will release the Contractor from further warranty work and responsibility, provided all previous warranty work has been completed and accepted by the Department.

3.6 Project Evaluation. Furnish cores to the Engineer according to KM 64-309 or 64-420, as applicable, to determine the pavement thickness. Install monument pins one foot from the outside edge of the shoulder marking the evaluation segments established on the Pavement Evaluation Section Location Plan.

3.6.1 Joint Evaluation Review Team. The Joint Evaluation Review Team will evaluate the project for the purpose of administering the warranty. While it is intended that administration of the warranty will be by consensus of the Joint Evaluation Review Team, voting will be as defined in parentheses herein. The team will consist of the following:

1) The Chief District Engineer or designated representative (1 vote).
2) The Project Development Team, consisting of the Project Manager, the Federal Highway Administration representative, the Kentucky Transportation Center (KTC) representative, and the Specifications representative (combined, 1 vote).
3) The Department's Central Office Team, consisting of a Division of Construction representative, a Division of Materials representative, and a Division of Operations representative (combined, 1 vote).
4) A Contractor representative (1 vote).

5) An asphalt or concrete paving industry representative or independent third party that is selected but not employed by the Contractor (1 vote).

3.6.2 Evaluation Procedures. An initial pavement condition survey will be conducted within 30 calendar days of the start date of the warranty. Annual pavement condition surveys will be conducted for the life of the warranty within 60 calendar days of the anniversary date of the start of the warranty. The KTC, in conjunction with the Department, will conduct the evaluation testing. An initial report and subsequent annual reports will be prepared by the KTC and will include a summary of all traffic data, including ESALs; a summary of all testing results; the results of pavement condition surveys; a listing of any deficiencies with recommended or performed corrective action; and any other recommendations for administration of the warranty.

The KTC will notify the Joint Evaluation Team prior to conducting their evaluation testing to allow observation.

3.7 Thresholds and Remedial Action. Perform required warranty work when pavement performance thresholds are exceeded, unless the Joint Evaluation Review Team directs otherwise. The indicators and threshold values are established at expected service levels to provide acceptable serviceability over the expected design life of the pavement. The KTC and the Department will follow the protocols in the Contract to evaluate pavement condition.

Asphalt Pavement Thresholds

3.7.1 Cracks.

Threshold:	Cracks, 1/4 inch wide or greater, and any previously sealed cracks that have opened to any measurable width.
Remedial Action:	When the sum of the lengths of the cracks exceeding the threshold within a segment is less than 50 linear feet, rout and seal the cracks with a self-leveling, silicone crack sealer. When the sum of the lengths of the cracks exceeding the threshold within a segment is equal to or greater than 50 linear feet (including sealed cracks), mill and inlay, or patch the portion of the surface with cracks unless otherwise directed. The Joint Evaluation Review Team may require an additional depth of milling, dependent upon the severity and extent of the measured cracking. Cracks less than 1/4-inch wide and fully sealed cracks (not opened) of any size will not be measured.

3.7.2 Rut Depth. The Department will measure the rut depth annually at the same time the roughness data is collected. Sensors on the equipment will measure the relative height from the sensor to the surface and calculate the rut depth as the relative differences of the readings of each wheel path. The Department will then calculate the average rut depth of both wheel paths in each segment.

Threshold:	Within the first 5 years -- >1/4-inch rut depth After the first 5 years ---- >3/8-inch rut depth
Remedial Action:	Mill and inlay the surface. Unless the Joint Evaluation Review Team directs otherwise, mill to the bottom of the existing surface course.

3.7.3 Open, Separated, and Raveling Joints.

Threshold: 1/4-inch wide or greater.
Remedial Action: When there is 10 linear feet of distress or greater exceeding the threshold, rout and seal the opening with a self-leveling, silicone crack sealer.

When the sum of the lengths of the distress within a segment meets or exceeds 250 linear feet, mill and reconstruct the portion of the segment with joint distress to a minimum width of one foot on both sides of the joint unless otherwise directed by the Joint Evaluation Review Team. Unless the Joint Evaluation Review Team directs otherwise, mill to the bottom of the surface course.

3.7.4 Potholes.

Threshold: One square foot, with a depth of 1/2 inch or greater.
Remedial Action: Remove and replace 150% of the distressed area to a depth as the Joint Evaluation Review Team directs.

3.7.5 Patching. For the purpose of this specification, patching is defined as any remedial repair.

Threshold:	For a segment:	Any 2 patches and remedial or preventive work on 25% of the surface, or any 5 patches.
	For the project:	25% of the segments resurfaced, or milled and inlayed.

Remedial Action: Mill and inlay the entire segment/project. Unless the Joint Evaluation Review directs otherwise, mill to the bottom of the existing surface course. The Joint Evaluation Review Team may allow resurfacing with a new surface course in lieu of the mill and inlay operation.

When patching is concentrated in one region, the Joint Evaluation Review Team may only require remedial action for the effected region.

3.7.6 Raveling, Flushing, and Bleeding. For purposes of this specification, raveling is defined as the wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of asphalt binder. Flushing and bleeding is described as the occurrence of excess binder occurring on the pavement surface, typically resulting in a shiny, glass-like, reflective surface that may be tacky to touch, usually occurring in the wheel paths.

Threshold: Flushing and Bleeding - 100 square feet.
Raveling – 50 square feet.

Remedial Action: Patch or mill and inlay as the Joint Evaluation Review Team directs.

3.7.7 Roughness (IRI). The Department will measure roughness in all driving lanes for the entire length of the warranty contract section. The Department will measure the roughness of the

segments annually. Equipment with profile measurement sensors that meet the criteria for a Class I device (ASTM E 950) will be used.

The device will measure the profile of both wheel paths of each driving lane and calculate the RI (ASTM E 1926) for each segment. The Department will use the average RI of the two wheel path measurements over each segment as the performance indicator for the warranty. The Department will exclude the first 25 feet at the construction joint at the beginning and end of the project and any bridge approaches.

Threshold: Initial. Minimum RI of 3.9.

After first year of warranty:	RI of 3.85
After second year of warranty:	RI of 3.81
After third year of warranty:	RI of 3.76
After fourth year of warranty:	RI of 3.72
After fifth year of warranty:	RI of 3.67
After sixth year of warranty:	RI of 3.63
After seventh year of warranty:	RI of 3.58
After eighth year of warranty:	RI of 3.54
After ninth year of warranty:	RI of 3.49
After tenth year of warranty:	RI of 3.45

Remedial Action: Mill and inlay the entire segment's surface. Unless the Joint Evaluation Review Team directs otherwise, mill to the bottom of the existing surface course.

PCC Pavement Thresholds

3.7.8 Cracks.

Threshold: 1/8-inch wide or greater.

Remedial Action: When the crack does not connect any two panel edges of the same panel, less than 1/8-inch faulting (1/8-inch elevation difference across the crack) is present, and there is no evidence of spalling, rout and seal the crack with a self-leveling, silicone sealant.

When the crack connects any 2 panel edges of the same panel, faulting is greater than 1/8 of an inch, or where spalling of the cracks is evident, perform partial panel replacement, full depth repair according to Special Provision 76. The Joint Evaluation Review Team may allow dowel bar retrofit in lieu of replacement.

3.7.9 Faulting at Joints and Cracks.

Threshold: 1/4-inch elevation differential across a joint or crack measured at the wheel path.

Remedial Action: When faulting is between 1/4 and 3/8 of an inch, diamond grind adjoining slabs for at least half their length. When faulting is greater than 5/16 of an inch or has previously been ground to correct faulting or other distresses, replace the panel full depth according to Special Provision 76. The Joint Evaluation Review Team may allow partial panel replacement in lieu of full panel replacement.

3.7.10 Spalling and Deterioration at Joints and Cracks. For the purpose of this specification, spalling of joints is defined as cracking, breaking, chipping, or fraying of slab edges within 2 feet of the longitudinal or transverse joint.

Threshold: 25 percent of an individual joint or a 3-foot or longer crack with a moderate severity level, as defined by the Strategic Highway Research Program, Distress Identification Manual for Long-Term Pavement Performance, Project SHRP-P-338, Moderate Level Severity of Spalling of Transverse Joints.

Remedial Action: For longitudinal joints, replace all panels adjoining the distressed area, full width and length, according to Special Provision 76. For transverse joints, remove and replace the joint according to Special Provision 76.

For transverse cracks greater than 3 feet in length, remove the distressed area, and reconstruct it as a transverse joint according to Special Provision 76.

When the crack is greater than 3 feet in length and not transverse, remove and replace the full panel according to Special Provision 76.

For cracks less than 3 feet in length, perform full-depth, partial panel repair according to Special Provision 76.

3.7.11 Scaling and Map Cracking. For the purpose of this specification, map cracking is defined as a series of cracks that extend only into the upper surface of the slab. Frequently, larger cracks are oriented in the longitudinal direction of the pavement and are interconnected by finer transverse or random cracks.

For the purpose of this specification, scaling is deterioration of the upper concrete slab surface resulting in the loss of surface mortar.

Threshold: 10% of any segment's surface area or 25% of the entire project's surface area.

Remedial Action: Diamond grind the entire surface area of the segment or project. When cracking is concentrated in one region, the Joint Evaluation Review Team may only require remedial action for the effected region.

3.7.12 Blowups and Shattered Panels. For the purpose of this specification, blowups are defined as localized upward movement of the pavement surface at transverse joints or cracks, often accompanied by shattering of the concrete in that area. Shattered panels are defined as any panel wherein cracking within the limits of the panel is such that the panel, in effect, is divided into at least 3 separate and distinct areas.

Threshold: Any occurrence.

Remedial Action: Replace the affected panel, full depth, according to Special Provision 76.

3.7.13 Joint Sealant.

Threshold: Any missing or damaged seals.

Remedial Action: Replace seals with a new seal of the same type.

3.7.14 Patching. For the purpose of this specification, patching is defined as any remedial repair excluding joint seal replacement and diamond grinding.

Threshold:	For a segment:	Any 2 patches and remedial or preventive work on 25% of the surface, or any 5 patches.
	For the project:	25% of the segments.
Remedial Action:	Diamond grind the entire surface area of the segment/project. When patching is concentrated in one region, the Joint Evaluation Review Team may only require remedial action for the effected region.	

3.7.15 Popouts. Popouts are defined as small pieces of pavement broken loose from the surface, normally ranging in diameter from 2 to 4 inches and depth from one to 2 inches.

Threshold: 15 popouts of any size, or any popout greater than 4 inches in diameter.

Remedial Action: Fill all popouts in the segment with epoxy grout.

3.7.16 Roughness. The Department will measure roughness in all driving lanes for the entire length of the warranty contract section. The Department will measure the roughness of the segments annually. The initial ride will be measured in terms of Profile Index (PI) and Rideability Index (RI). For subsequent warranty testing, the pavement will only be measured in RI.

The Department will measure the RI using equipment with profile measurement sensors that meet the criteria for a Class I device (ASTM E 950). The device will measure the profile of both wheel paths of each driving lane and calculate the RI (ASTM E 1926) for each segment. The Department will use the average RI of the two wheel path measurements over each segment as the performance indicator for the warranty. The Department will exclude the first 25 feet at the construction joint at the beginning and end of the project and any bridge approaches.

The Department will use measure the PI using a Rainhart Profilograph Catalog No. 860 with a 0.1 inch blanking band according to ASTM E 1274. The Department will take profiles 3 feet from and parallel to each edge and at the approximate location of each planned longitudinal joint. The Engineer will exclude from testing all pavement within 20 feet of any discontinuity in the pavement such as bridges.

Threshold: Initial. Minimum RI of 3.55 or maximum of 8 inches per mile.

After first year of warranty:	RI of 3.50
After second year of warranty:	RI of 3.46
After third year of warranty:	RI of 3.41
After fourth year of warranty:	RI of 3.37
After fifth year of warranty:	RI of 3.32
After sixth year of warranty:	RI of 3.28
After seventh year of warranty:	RI of 3.23
After eighth year of warranty:	RI of 3.19
After ninth year of warranty:	RI of 3.14
After tenth year of warranty:	RI of 3.10

Remedial Action: Unless the Joint Evaluation Review Team directs otherwise, diamond grind the entire segment area.

3.8 Remedial Work. Perform remedial action on all segments of the project where the threshold levels are met or exceeded. Consider the remedial actions listed within this note to be the standard. The Joint Evaluation Review Team may consider allowing alternate remedial action under special circumstances. Submissions for alternate remedial action must include justifications for the change, pavement conditions, any test results, reason for the failure, and the alternate method. Approval is conditioned upon approval by the Joint Evaluation Review Team. Prior to proceeding with any warranty work or monitoring, obtain an Encroachment Permit from the Department. The Joint Evaluation Review Team will determine the schedule for completing the remedial work.

The Contractor has the first option to perform the remedial work. If, in the opinion of the Department, a problem requires immediate attention for the safety of the traveling public and the Contractor does not perform necessary remedial work within 24 hours of notification, the Department has the option to have the remedial work performed by other forces. The Contractor is responsible for paying for all the costs incurred, including lane rental fees. Remedial work performed by other forces will not alter the requirements, responsibilities, or obligations of the warranty.

When remedial action work or elective/preventive action necessitates corrective actions to the pavement markings, adjacent lane(s), or roadway shoulders, then such corrective actions to the pavement markings, adjacent lane(s), and shoulders will be the responsibility of the Contractor.

When remedial actions are required, the affected segments will be inspected and retested as necessary. The appropriate threshold values must not be exceeded upon retesting of the remediation. Warranty requirements for all remedial work will be limited to the life of the original contract warranty.

3.9 Elective/Preventive Action. The Department will allow elective/preventive action with prior approval from the Joint Evaluation Review Team. Submit all requests and a work plan to the Joint Evaluation Review Team in writing. The team will respond within 30 days of submission.

3.10 Lane Closures. For all remedial work and any elective preventive work, a cost of $1,500.00 per hour will be charged for all lane closures throughout the warranty period. Close only one lane at a time. The Department will require payment, payable to the Commonwealth of Kentucky, within 60 days after completion of remedial or elective work.

3.11 Department Maintenance. The Department will not perform routine pavement maintenance activities during the warranty period. The Department will perform other routine maintenance during the warranty period such as snow-plowing, applying de-icing chemicals, repairs to safety appurtenances, pavement markings, mowing, and sign maintenance.

3.12 Acceptance. The final condition survey will occur within 60 days of the end of the warranty period. Complete remedial work, if required, on a schedule determined by the Joint Evaluation Review Team. The Department will accept the project following the satisfactory completion of all remedial work.

3.13 Warranty Exemptions. The Contractor will not be held responsible for distresses which are caused by factors beyond the control of the Contractor such as subsurface conditions or damage from fire, chemical spills, or damage caused by others. The Contractor will be responsible for the pavement mix and its placement.

If the accumulated Kentucky ESALs in any lane of the sections (per direction) as defined below exceeds the following thresholds for the number of years warranted, the warranty period will end at that time for the section (per direction). ESAL thresholds for warranty periods other than that specified in the bid will not apply for release of the warranty.

Section A I-275 MP 4.06 to 7.15 (Eastbound)	
Warranty Period Selected	**ESAL Threshold**
5	2,900,000
6	3,500,000
7	4,100,000
8	4,700,000
9	5,300,000
10	5,900,000
Section A I-275 MP 4.06 to 7.15 (Westbound)	
Warranty Period Selected	**ESAL Threshold**
5	2,900,000
6	3,500,000
7	4,100,000
8	4,700,000
9	5,300,000
10	5,900,000
Section B I-275 MP 1.06 to 4.06 (Eastbound)	
Warranty Period Selected	**ESAL Threshold**
5	5,900,000
6	7,100,000
7	8,200,000
8	9,400,000
9	10,600,000
10	11,800,000

4.0 MEASUREMENT.

4.1 Warranted Pavement. The Department will measure the quantity in square yards. The Department will not measure the providing of a warranty bond or performing mix design, pavement design, quality control, installing monuments, elective, preventive, or warranty work for separate payment and will consider them incidental to this item of work. No pay incentives or disincentives will be made based on any mix test results.

The Department will not measure the cost of increasing the thickness of pavement beyond the original design or any work performed to accommodate the increase in thickness and will consider it incidental to the pavement bid cost per square yard.

The Department will deduct for deficient thickness according to Subsections 402.04.02 or 501.03.21, as applicable, based on the minimum design pavement thickness.

The Department will measure the bond breaker and leveling courses as separate bid items and will not included them in the Warranted Pavement quantities.

4.2 Traffic Monitoring. The Department will measure the quantity as Lump Sum. The Department will not measure any work or equipment required to obtain, process, and supply the required data for separate payment and will consider them incidental to this item of work.

4.3 Vehicle Classification and WIM Detectors. The Department will not measure the quantity or their maintenance for payment and will consider them incidental to Traffic Monitoring. The Department will take ownership and maintenance responsibility of the detector and monitoring equipment at the end of the pavement warranty period.

4.4 Pavement Evaluation. The Department will not measure participation in the Joint Evaluation Review Team and will consider it incidental to the Warranted Pavement.

4.5 Ride Quality. The Department will apply a ride quality adjustment for each 1,000-foot segment based on the initial pavement condition survey. The Department will adjust the Contract unit price for square yard of mainline pavement for each test segment in accordance with the following schedule.

Asphalt RI	PCC PI	Pay Value
> 4.30	< 1.5	+0.05
4.21 to 4.30	1.5 to 2.5	+0.03
4.05 to 4.02	2.6 to 4.0	+0.01
3.90 to 4.04	4.1 to 8.0	No adjustment.
< 3.90	> 8	Remedial work required.

5.0 PAYMENT. The Department will make payment for the completed and accepted quantities under the following:

Code	Pay Item	Pay Unit
----	Warranted Pavement	Square Yard
----	Traffic Monitoring	Lump Sum

The Department will consider payment as full compensation for the work required under this note.

March 3, 2000

APPENDIX B
Special Note for A+B-C Bidding

I 275 Boone-Kenton Counties
IM 275-9 (94) 5
Item Numbers: 6-2009.00 & 6-2010.00
IM 275-9(89), FD52 008 0275 004-008 052D
IM 275-9(88), FD52 121 SW97 068D

SPECIAL NOTE

INCENTIVE PAY AND LIQUIDATED DAMAGES AND OPTIONAL PAVEMENT WARRANTY "A+B-C"

The procedure for evaluation of bids on this project involves an "A+B-C" concept.

The "A" component of the bid involves the dollar amount for all work to be performed under the contract.

The "B" component of the bid involves the total number of calendar days required to **complete all work.**

The "C" component involves the number of years of optional pavement warranty and is a credit for providing an optional warrant for the pavement as described in "SPECIAL NOTE FOR WARRANTED PAVEMENT," March 3, 2000.

Preparation of Bid Proposal

In addition to the requirements of Section 102 of the 2000 Standard Specifications, the bidder shall establish the number of calendar days necessary to complete the work in accordance with the plans and specifications and show this number in the bid proposal. The product of this number of calendar days times the average daily road user benefit of $25,000 per day shall be added to the total bid determined for bid items. The product of calendar days times the average daily road user benefit shall not be considered in determining mobilization and demobilization costs.

The maximum number of calendar days permitted for this project will be 550 calendar days. Bids will not be accepted for any proposal wherein the bidder establishes calendar days necessary to complete the work in excess of 550 calendar days.

The contractor will be required to provide a five-year warranty on the pavement in accordance with "SPECIAL NOTE FOR WARRANTED PAVEMENT," March 3, 2000. The bidder shall establish the number of years of an optional pavement warranty for years 6 through 10. The value of the warranty used to determine the "C" component for comparison of bids is defined as follows:

5-year Pavement Warranty	Required	C= $0.00
6-year Pavement Warranty	Optional	C= $500,000.00
7-year Pavement Warranty	Optional	C= $1,000,000.00
8-year Pavement Warranty	Optional	C= $1,500,000.00
9-year Pavement Warranty	Optional	C= $2,100,000.00
10-year Pavement Warranty	Optional	C= $2,900,000.00

The sum of "A"+"B"-"C" as defined above will be the amount used for comparison of bids.

Proposal Guaranty

As a supplement to Section 102 of the 2000 Standard Specifications, it will not be necessary for the Proposal Guaranty to include an amount necessary to cover the product of calendar days times daily road user benefit.

Consideration of Bids

Each bid submitted shall consist of three parts:

A. The dollar amount for all work to be performed under the contract.

B. The total number of calendar days required to **complete all work.**

C. The value of the warranty as defined above.

The lowest and best bid will be determined by the Department as the lowest combination of (A) and (B) and (C) according to the following formula:

(A) + [(B) x ($25,000.00)]-(C)

The value $25,000.00 per calendar day is the stipulated adjustment of road user benefit/cost. The above formula shall be used only for determination of the lowest and best bidder and shall not be used to determine the final payment to the contractor when the project is completed.

Reduction and Extension of Contract Time

Contract time for this project will be on a calendar day basis. Any extension of contract time will be in accordance with the 2000 Standard Specifications. However, contrary to Section 108 of the 2000 Standard Specifications, in the event that a total contract change involves a decrease equal to or greater than five percent of the original contract cost, the contract time will be shortened in direct proportion to the contract amount/calendar day ratio of the original contract. Also, contrary to Section 108 of the 2000 Standard Specifications, contract time may begin sooner than 31 calendar days following the date of the notice to begin work if the Contractor initiates any activity that requires a lane closure. Contract time will be counted continually beginning with this occurrence. All contract time adjustments shall be made at the end of the contract based on the final contract amount.

Early Completion of Work

The contractor will be paid an incentive payment of $25,000.00 for each calendar day the project is completed before the established completion date, not to exceed an amount equal to 3 percent of the awarded contract amount ("Part A" of the (A) + [B x $25,000.00) –(C) formula).

Failure to Complete the Work on Time

Liquidated damages (disincentive costs) will be assessed in accordance with Section 108 of the 2000 Standard Specifications excepting for the following: (1) The daily charge will be $25,000.00, (2) Contrary to Section 108 of the 2000 Standard Specifications, liquidated damages (disincentive costs) will be charged for each calendar day, including the months of December, January, February, and March, and (3) Liquidated damages (disincentive costs) will be charged even if work on the controlling item of operation is prohibited by seasonal limitations. There is no maximum for the amount of disincentive fees that can be charged.

Definition of a Calendar Day

A Calendar day is defined as a 24-hour period beginning at the nearest hour for the beginning of work and ending at the nearest hour the lanes are completely open to traffic and all other work completed. The assessment of the $25,000.00 per day penalty or payment of the $25,000.00 per day incentive will be prorated to the nearest hour.

March 9, 2000

Appendix C
Unit Bid Tabulations

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
UNIT TABULATION OF BIDDERS

COUNTY * BOONE-KENTON 06
PROJECT NO. * IM 275-9 (94) 5
ROAD * I 75
TYPE * GRADE, DRAIN, PAVEMENT, REHABILITATION, AND SIGNING

LENGTH OF PROJECT * 6.7700 MILES
TIME FOR COMPLETION * 055 CALENDAR DAYS
PROJECT CODE * 00-0227

DATE 03-31-00

1	THE W L HARPER CO	$29,728,278.06	4		$
2	EATON ASPHALT PAVING CO INC AND	$33,925,877.54	5		$
3	BAKER CONCRETE CONSTRUCTION INC	$34,645,570.61	6		$

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID
1	STRUCTURE GRANULAR BACKFILL	16.000	CU YD	32.0000	93.6000	83.0000			
2	REMOVING CONCRETE MASONRY	151.300	CU YD	250.0000	520.0000	475.0000			
3	STRUCTURE EXCAV-SOLID ROCK	200.300	CU YD	85.0000	46.8000	42.5000			
4	FOUNDATION PREPARATION	1.000	LP SUM	6700.0000	5200.0000	3715.0000			
5	FOUNDATION PREPARATION	1.000	LP SUM	6700.0000	5200.0000	3715.0000			
6	FOUNDATION PREPARATION	1.000	LP SUM	47500.0000	7280.0000	5575.0000			
7	FOUNDATION PREPARATION	1.000	LP SUM	47500.0000	18720.0000	14500.0000			
8	CONCRETE-CLASS A	290.500	CU YD	288.0000	468.0000	300.0000			
9	CONCRETE-CLASS AA	237.300	CU YD	600.0000	988.0000	880.0000			
10	CONCRETE-CLASS AAA	636.000	CU YD	380.0000	624.0000	525.0000			
11	STEEL REINFORCEMENT	68010.000	LB	0.5600	0.7300	0.5600			
12	STEEL REINF-EPOXY COATED	162246.000	LB	0.6200	0.9400	0.6300			
13	STRUCTURAL STEEL 2107 LBS	1.000	LP SUM	4600.0000	11440.0000	9750.0000			
14	STRUCTURAL STEEL 2107 LBS	1.000	LP SUM	4600.0000	11440.0000	9750.0000			
15	STRUCTURAL STEEL 1866 LBS	1.000	LP SUM	4000.0000	9360.0000	8625.0000			
16	STRUCTURAL STEEL 1940 LBS	1.000	LP SUM	4500.0000	9880.0000	9000.0000			
17	STRUCTURAL STEEL 1940 LBS	1.000	LP SUM	4500.0000	9880.0000	9000.0000			
18	PRECAST PC I BEAM TYPE II	1642.600	LIN FT	104.0000	135.2000	120.0000			
19	PRECAST PC I BEAM TYPE III	321.100	LIN FT	171.0000	166.4000	150.0000			
20	PILES-STEEL HP12X53	385.000	LIN FT	52.0000	45.7600	41.0000			
21	ELECTRICAL CONDUIT	1.000	LP SUM	4000.0000	6448.0000	5750.0000			
22	ELECTRICAL CONDUIT	1.000	LP SUM	4000.0000	6448.0000	5750.0000			
23	ELECTRICAL CONDUIT	1.000	LP SUM	3700.0000	5408.0000	5000.0000			
24	ELECTRICAL CONDUIT	1.000	LP SUM	2600.0000	4680.0000	4035.0000			
25	ELECTRICAL CONDUIT	1.000	LP SUM	2600.0000	3328.0000	2750.0000			
26	COFFERDAM-PIER 2	1.000	LP SUM	19800.0000	15600.0000	11650.0000			
27	COFFERDAM-PIER 2	1.000	LP SUM	19800.0000	15600.0000	11650.0000			
28	STRUCTURE EXCAVATION-COMMON	75.000	CU YD	100.0000	20.8000	18.6500			
29	JACK & SUPPORT BRIDGE SPANS	1.000	LP SUM	120000.0000	52000.0000	41000.0000			
30	MASONRY COATING	4252.600	SQ YD	8.0000	4.6800	3.7500			
31	EXPANSION DAM-2 INCH NEOPRENE	99.700	LIN FT	90.0000	93.6000	82.0000			
32	EXPANSION DAM-1 1/2" NEOPRENE	224.000	LIN FT	85.0000	83.2000	75.0000			
33	REMOVE EXISTING HANDRAIL	1359.000	LIN FT	2.0000	2.0800	1.5600			

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
UNIT TABULATION OF BIDDERS

COUNTY * BOONE-KENTON 06
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3	BAKER CONCRETE CONSTRUCTION INC	$34,645,570.61	6	$

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID
34	MACHINE PREP OF EXISTING SLAB	158.000	SQ YD	46.0000	31.2000	16.1500			
35	DRAINAGE BLANKET-EMBANKMENT	787.000	CU YD	19.0000	28.6000	47.4000			
36	CRUSHED AGGREGATE SIZE NO 2	25009.000	TON	11.0000	15.6000	11.7500			
37	ASPHALT SEAL AGGREGATE	1250.000	TON	54.0000	31.7200	57.5000			
38	CL3 ASPH BASE 1.50E PG64-22	13187.000	TON	44.5000	34.9300	47.4000			
39	CL2 ASPH BASE 1.00E PG64-22	16941.000	TON	41.1000	40.2500	43.7700			
40	CL3 ASPH BASE 1.00E PG76-22	15044.000	TON	49.2000	39.9200	52.4000			
41	CL3 ASPH BASE 0.75E PG64-22	1068.000	TON	41.5000	36.5100	44.2000			
42	EMULSIFIED ASPHALT RS-2	132.000	TON	275.0000	193.7800	293.0000			
43	CL2 ASPH SURF 0.38E PG64-22	3584.000	TON	49.6500	47.9000	53.0000			
44	CL2 ASPH SURF 0.5E PG64-22	527.000	TON	53.2000	49.2900	57.0000			
45	CL3 ASPH SURF 0.50B PG64-22	491.000	TON	51.5000	45.0900	55.0000			
46	CL3 ASPH SURF 0.50A PG76-22	5604.000	TON	56.9000	44.9000	61.0000			
47	CULVERT PIPE-15 INCH	60.000	LIN FT	50.0000	52.0000	36.0000			
48	PERFORATED PIPE-4 INCH	113077.000	LIN FT	3.8000	4.8900	3.5000			
49	NON-PERFORATED PIPE-4 INCH	8669.000	LIN FT	4.0000	10.6600	5.0000			
50	INSP & CERT EDGE DRAIN SYS	1.000	LP SUM	25000.0000	29224.0000	30000.0000			
51	INSP & CERT EDGE DRAIN SYS	1.000	LP SUM	5000.0000	2080.0000	2130.0000			
52	PERF PIPE HEADWALL TY 1-4 INCH	29.000	EACH	625.0000	364.0000	340.0000			
53	PERF PIPE HEADWALL TY 3-4 INCH	70.000	EACH	625.0000	442.0000	360.0000			
54	PERF PIPE HEADWALL TY 4-4 INCH	157.000	EACH	625.0000	416.0000	360.0000			
55	CURB BOX INLET TYPE B	6.000	EACH	4000.0000	2938.0000	2100.0000			
56	RECONSTRUCT MEDIAN BOX INLET	35.000	EACH	1550.0000	2860.0000	1400.0000			
57	FLUME INLET TYPE 1	1.000	EACH	2650.0000	3640.0000	1200.0000			
58	FLUME INLET TYPE 2	14.000	EACH	2650.0000	3432.0000	1200.0000			
59	REMOVING INLET	4.000	EACH	250.0000	291.2000	250.0000			
60	RECONSTRUCT EXISTING INLET	2.000	EACH	2500.0000	2080.0000	3350.0000			
61	ISLAND CURB AND GUTTER	110.000	LIN FT	20.0000	31.2000	48.0000			
62	ISLAND HEADER CURB TYPE 1	1292.000	LIN FT	23.2500	18.7200	13.0000			
63	ASPHALT WEDGE CURB	4453.000	LIN FT	5.0000	4.7200	5.3000			
64	DELINEATOR FOR GUARDRL-YELLOW	324.000	EACH	4.1000	7.3300	4.4000			
65	DELINEATOR FOR BARRIER-WHITE	430.000	EACH	4.1000	6.0500	4.4000			
66	DELINEATOR FOR BARRIER-YELLOW	1954.000	EACH	4.1000	6.0300	4.4000			

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
UNIT TABULATION OF BIDDERS

COUNTY * BOONE-KENTON 06
PROJECT NO. * IM 275-9 (94) 5
ROAD * I 75
TYPE * GRADE, DRAIN, PAVEMENT, REHABILITATION, AND SIGNING

LENGTH OF PROJECT * 6.7700 MILES
TIME FOR COMPLETION * 055 CALENDAR DAYS
PROJECT CODE * 00-0227

DATE 03-31-00

1	THE W L HARPER CO	$29,728,278.06	4	$
2	EATON ASPHALT PAVING CO INC AND	$33,925,877.54	5	$
3	BAKER CONCRETE CONSTRUCTION INC	$34,645,570.61	6	$

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID
67	TEMP CONC MED BAR TY 9M INST	25400.000	LIN FT	14.2500	15.6000	8.0000			
68	CONCRETE BARRIER WALL TYPE 9T	17000.000	LIN FT	30.0000	53.0400	45.0000			
69	RELOCATE TEMP CONC MED BARRIER	82920.000	LIN FT	0.5000	3.3300	2.0000			
70	BARRICADE-TYPE III	3.000	EACH	75.0000	215.2800	420.0000			
71	REMOVING CONCRETE ISLAND	3235.000	SQ YD	5.0000	11.4400	3.5000			
72	REMOVING PAVED DITCH	4478.000	SQ YD	6.2500	4.1600	6.0000			
73	ROADWAY EXCAVATION	43896.000	CU YD	5.6000	7.2800	8.0000			
74	SPECIAL EMBANKMENT FOR MED	39162.000	CU YD	0.5000	7.2800	7.0000			
75	DITCHING	15000.000	LIN FT	2.6000	2.6000	2.0000			
76	GUARDRAIL-STEEL W BEAM-S FACE	30700.000	LIN FT	11.5700	12.0300	10.5000			
77	GUARDRAIL-STEEL W BEAM-D FACE	550.000	LIN FT	16.2000	16.8500	17.5000			
78	GUARDRAIL TERMINAL SECT NO 1	2.000	EACH	50.0000	52.0000	98.0000			
79	GUARDRAIL CON TO BR END TYPE A	15.000	EACH	480.0000	499.2000	500.0000			
80	CRASH CUSHION TYPE IX-A	4.000	EACH	5025.0000	5226.0000	8500.0000			
81	GUARDRAIL END TREATMENT TYPE 1	38.000	EACH	2750.0000	2860.0000	2800.0000			
82	GUARDRAIL END TREATMENT TY 2A	38.000	EACH	360.0000	374.4000	375.0000			
83	REMOVING GUARDRAIL	30859.000	LIN FT	2.0700	2.1500	1.7000			
84	REMOVING & RESETTING GUARDRAIL	337.500	LIN FT	10.1000	10.5000	16.0000			
85	GUARDRAIL CON TO BR END TY A-1	6.000	EACH	215.0000	223.6000	185.0000			
86	SPECIAL BRIDGE GUARDRAIL	262.500	LIN FT	23.0000	23.9200	21.0000			
87	GUARDRAIL END TREATMENT TY 4A	1.000	EACH	1525.0000	1586.0000	1600.0000			
88	CHANNEL LINING CLASS II	3784.000	TON	23.8000	23.9200	23.0000			
89	CLEARING AND GRUBBING	1.000	LP SUM	45000.0000	41184.0000	130000.0000			
90	CLEARING AND GRUBBING	1.000	LP SUM	7000.0000	4056.0000	62000.0000			
91	SIGNS	17394.000	SQ FT	12.1100	4.1600	13.0000			
92	TEMPORARY SIGNAL	1.000	LP SUM	9000.0000	9360.0000	9600.0000			
93	DELINEATOR POSTS	495.000	EACH	36.2500	37.7000	11.0000			
94	EDGE KEY	196.000	LIN FT	190.0000	22.5500	200.0000			
95	FABRIC-GEOTEXTILE TYPE IV	7942.000	SQ YD	1.7000	1.4000	1.1000			
96	REMOVING HEADWALL	1.000	EACH	500.0000	364.0000	400.0000			
97	MAINTAIN AND CONTROL TRAFFIC	1.000	LP SUM	40000.0000	83167.3500	230000.0000			
98	MAINTAIN AND CONTROL TRAFFIC	1.000	LP SUM	125000.0000	54984.5500	200000.0000			
99	VAR MESSAGE SIGN-PORT 3 LINE	7.000	EACH	11000.0000	19760.0000	12000.0000			

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
UNIT TABULATION OF BIDDERS

COUNTY * BOONE-KENTON 06
PROJECT NO. * IM 275-9 (94) 5
ROAD * I 75
TYPE * GRADE, DRAIN, PAVEMENT, REHABILITATION, AND SIGNING

LENGTH OF PROJECT * 6.7700 MILES
TIME FOR COMPLETION * 055 CALENDAR DAYS
PROJECT CODE * 00-0227

DATE 03-31-00

1	THE W L HARPER CO	$29,728,278.06	4		$
2	EATON ASPHALT PAVING CO INC AND	$33,925,877.54	5		$
3	BAKER CONCRETE CONSTRUCTION INC	$34,645,570.61	6		$

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID
100	TEMPORARY SILT FENCE	4000.000	LIN FT	1.6500	2.8600	1.3000			
101	SILT CHECK	29.000	EACH	65.0000	114.4000	60.0000			
102	CLEAN SILT CHECK	58.000	EACH	50.0000	114.4000	45.0000			
103	CLEAN TEMPORARY SILT FENCE	8000.000	LIN FT	0.7500	2.8600	0.5000			
104	STAKING	1.000	LP SUM	202950.0000	67600.0000	160000.0000			
105	STAKING	1.000	LP SUM	22550.0000	67600.0000	80000.0000			
106	FLASHING ARROW	8.000	EACH	2000.0000	4850.5600	2000.0000			
107	CRASH CUSHION TYPE VI-T	5.000	EACH	7205.0000	20592.0000	7500.0000			
108	RELOCATE CRASH CUSHION	6.000	EACH	2700.0000	3016.0000	3000.0000			
109	CRASH CUSHION TYPE IX	2.000	EACH	5350.0000	5564.0000	22500.0000			
110	LANE CLOSURE	28.000	EACH	900.0000	1200.0000	1050.0000			
111	TEMP TRAFFIC SIGNAL-2 PHASE	1.000	EACH	9000.0000	9360.0000	9600.0000			
112	TEMP SEEDING AND PROTECTION	22968.000	SQ YD	0.5000	0.7500	0.3000			
113	TOPDRESSING FERTILIZER	13.000	TON	580.0000	603.2000	500.0000			
114	SEEDING AND PROTECTION	229679.000	SQ YD	0.3100	0.3200	0.3600			
115	PAVE STRIPING-TEMP PAINT-6 IN	347000.000	LIN FT	0.0700	0.2300	0.0800			
116	PAVE STRIPING-PERM PAINT-4 IN	4780.000	LIN FT	0.4600	0.2100	0.5000			
117	PAVE STRIPING-TEMP REM TAPE-W	102456.000	LIN FT	0.8900	1.1400	1.0000			
118	PAVE STRIPING-TEMP REM TAPE-Y	93769.000	LIN FT	0.8900	1.1400	1.0000			
119	PAVE MRKG-THERMO STOP BAR-24"	48.000	LIN FT	4.6500	10.1400	5.0000			
120	PAVEMENT MARKER TYPE IV-B W/R	454.000	EACH	6.5000	6.5000	6.7500			
121	PAVEMENT MARKER TY IVA-MW TEMP	3047.000	EACH	4.0000	6.5000	4.2500			
122	PAVEMENT MARKER TY IVA-MY TEMP	1976.000	EACH	4.0000	6.5000	4.2500			
123	PAVEMENT MARKER TYPE V-INSTALL	1523.000	EACH	12.8500	16.3800	14.0000			
124	PAVEMENT MARKER TYPE V-INSTALL	438.000	EACH	12.8500	16.3800	14.0000			
125	CONCRETE-CLASS A	12.500	CU YD	500.0000	624.0000	300.0000			
126	STEEL REINFORCEMENT	400.000	LB	0.5000	3.1200	1.0000			
127	REMOVE EXISTING SUPERSTRUCTURE	1.000	LP SUM	146000.0000	43680.0000	50000.0000			
128	SAW & SEAL JOINTS IN ASPH PAVE	20025.000	LIN FT	1.9000	2.8600	1.6000			
129	MEDIAN CROSSOVER	1.000	EACH	8750.0000	27560.0000	8200.0000			
130	MEDIAN CROSSOVER	1.000	EACH	8750.0000	27560.0000	8200.0000			
131	MEDIAN CROSSOVER	1.000	EACH	8750.0000	27560.0000	7500.0000			
132	MEDIAN CROSSOVER	1.000	EACH	8750.0000	27560.0000	6100.0000			

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
UNIT TABULATION OF BIDDERS

COUNTY * BOONE-KENTON 06
PROJECT NO. * IM 275-9 (94) 5
ROAD * I 75
TYPE * GRADE, DRAIN, PAVEMENT, REHABILITATION, AND SIGNING

LENGTH OF PROJECT * 6.7700 MILES
TIME FOR COMPLETION * 055 CALENDAR DAYS
PROJECT CODE * 00-0227

DATE 03-31-00

1	THE W L HARPER CO	$29,728,278.06	4	$
2	EATON ASPHALT PAVING CO INC AND	$33,925,877.54	5	$
3	BAKER CONCRETE CONSTRUCTION INC	$34,645,570.61	6	$

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID
133	SLIP RAMP	1.000	LP SUM	6850.0000	20540.0000	8200.0000			
134	SLIP RAMP	1.000	LP SUM	6850.0000	16380.0000	8200.0000			
135	SLIP RAMP	1.000	LP SUM	6850.0000	20852.0000	18000.0000			
136	SLIP RAMP	1.000	LP SUM	6850.0000	26260.0000	15500.0000			
137	SLIP RAMP	1.000	LP SUM	6850.0000	20540.0000	11500.0000			
138	SLIP RAMP	1.000	LP SUM	6850.0000	16380.0000	5500.0000			
139	SLIP RAMP	1.000	LP SUM	6850.0000	16380.0000	16200.0000			
140	SLIP RAMP	1.000	LP SUM	6850.0000	26260.0000	12800.0000			
141	SLIP RAMP	1.000	LP SUM	6850.0000	17290.0000	6000.0000			
142	SLIP RAMP	1.000	LP SUM	6850.0000	17290.0000	5600.0000			
143	SLIP RAMP	1.000	LP SUM	6850.0000	16380.0000	5800.0000			
144	SLIP RAMP	1.000	LP SUM	6850.0000	20540.0000	23000.0000			
145	SLIP RAMP	1.000	LP SUM	6850.0000	20540.0000	14700.0000			
146	SLIP RAMP	1.000	LP SUM	6850.0000	16120.0000	4700.0000			
147	SLIP RAMP	1.000	LP SUM	6850.0000	14040.0000	8200.0000			
148	SLIP RAMP	1.000	LP SUM	6850.0000	11440.0000	8200.0000			
149	SLIP RAMP	1.000	LP SUM	6850.0000	18720.0000	8200.0000			
150	SLIP RAMP	1.000	LP SUM	6850.0000	19240.0000	8200.0000			
151	TEMPORARY RAMP	1.000	LP SUM	4600.0000	11440.0000	18200.0000			
152	TEMPORARY RAMP	1.000	LP SUM	4600.0000	11440.0000	3600.0000			
153	TEMPORARY RAMP	1.000	LP SUM	4600.0000	11440.0000	9400.0000			
154	TEMPORARY RAMP	1.000	LP SUM	4600.0000	11440.0000	3500.0000			
155	TEMPORARY RAMP	1.000	LP SUM	4600.0000	11440.0000	12400.0000			
156	TEMPORARY RAMP	1.000	LP SUM	4600.0000	9620.0000	2600.0000			
157	TEMPORARY RAMP	1.000	LP SUM	4600.0000	4680.0000	12800.0000			
158	TEMPORARY RAMP	1.000	LP SUM	4600.0000	5148.0000	8200.0000			
159	TEMPORARY RAMP	1.000	LP SUM	4600.0000	4940.0000	8200.0000			
160	TEMPORARY RAMP	1.000	LP SUM	4600.0000	4680.0000	8200.0000			
161	TEMPORARY RAMP	1.000	LP SUM	4600.0000	4420.0000	8200.0000			
162	RELAPPING GUARDRAIL	475.000	LIN FT	2.4000	2.5000	10.5000			
163	TRAFFIC MONITORING	1.000	LP SUM	396000.0000	739440.0000	640000.0000			
164	TRAFFIC MONITORING	1.000	LP SUM	210000.0000	546000.0000	426000.0000			
165	D G A BASE	134475.000	TON	12.4000		11.0000			

COUNTY * BOONE-KENTON 06 DEPARTMENT OF HIGHWAYS LENGTH OF PROJECT * 6.7700 MILES
PROJECT NO. * IM 275-9 (94) 5 UNIT TABULATION OF BIDDERS TIME FOR COMPLETION * 055 CALENDAR DAYS
ROAD * I 75 PROJECT CODE * 00-0227
TYPE * GRADE, DRAIN, PAVEMENT, REHABILITATION, AND SIGNING

DATE 03-31-00

1	THE W L HARPER CO	$29,728,278.06	4	$
2	EATON ASPHALT PAVING CO INC AND	$33,925,877.54	5	$
3	BAKER CONCRETE CONSTRUCTION INC	$34,645,570.61	6	$

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID
166	DRAINAGE BLANKET-TYPE I-UNTR	10192.000	TON	17.4000		10.0000			
167	ASPHALT CURING SEAL	43.000	TON	275.0000		300.0000			
168	REMOVING PAVEMENT	73508.000	SQ YD	3.3000		5.0000			
169	PAVE STRIPING-THERMO-6 INCH W	21421.000	LIN FT	0.4000		0.5000			
170	PAVE STRIPING-THERMO-6 INCH Y	18019.000	LIN FT	0.4000		0.5000			
171	PAVE STRIPING-DUR TY 1-6" W	109201.000	LIN FT	2.7800		3.0000			
172	PAVE STRIPING-DUR TY 1-6" Y	77729.000	LIN FT	2.8700		3.0000			
173	PAVE STRIPING-DUR TY 1-12" W	3915.000	LIN FT	3.9700		4.2500			
174	DRAINAGE LAYER/BOND-BREAK MIX	17083.000	TON	36.4000		39.0000			
175	PCC OVERLAY-9" WARR	127048.000	SQ YD	23.8200		26.0000			
176	PCC OVERLAY-10" WARR	51957.000	SQ YD	26.0400		28.0000			
177	PCC SHLD OVERLAY-9" NON-WARR	71148.000	SQ YD	24.2800		31.0000			
178	PCC SHLD OVERLAY-10" NON-WARR	28305.000	SQ YD	26.6900		32.0000			
179	PCC OVERLAY-9" NON-WARR	4251.000	SQ YD	31.6200		35.0000			
180	PCC OVERLAY-10" NON-WARR	914.000	SQ YD	32.7000		37.0000			
181	PCC PAVE REPLACE-12" WARR	21255.000	SQ YD	31.4300		38.0000			
182	PCC PAVE REPLACE-13" WARR	9830.000	SQ YD	31.2800		40.0000			
183	PCC SHLD REPLACE-12" NON-WARR	13356.000	SQ YD	29.8800		37.0000			
184	PCC SHLD REPLACE-13" NON-WARR	6121.000	SQ YD	30.3400		39.0000			
185	PCC PAVE REPLACE-12" NON-WARR	3745.000	SQ YD	34.8700		36.0000			
186	PCC PAVE REPLACE-13" NON-WARR	1155.000	SQ YD	35.9500		42.0000			
187	REMOVING PAVEMENT	81026.000	SQ YD		4.8900				
188	D G A BASE	152394.000	TON		12.2200				
189	DRAINAGE BLANKET-TYPE II-ASPH	12140.000	TON		23.8900				
190	LEVELING AND WEDGING PG64-22	12755.000	TON		33.4700				
191	ASPHALT CURING SEAL	51.000	TON		293.1300				
192	BREAKING AND SEATING PAVEMENT	183331.000	SQ YD		1.5900				
193	PAVE STRIPING-THERMO-6 INCH W	103308.000	LIN FT		0.6900				
194	PAVE STRIPING-THERMO-6 INCH Y	77072.000	LIN FT		0.6700				
195	PAVE STRIPING-THERMO-12 INCH W	3914.000	LIN FT		2.0300				
196	PAVE STRIPING-DUR TY 1-6" W	27314.000	LIN FT		2.9600				
197	PAVE STRIPING-DUR TY 1-6" Y	18676.000	LIN FT		2.9600				
198	PAVE STRIPING-DUR TY 1-12" W	400.000	LIN FT		7.0200				

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
UNIT TABULATION OF BIDDERS

COUNTY * BOONE-KENTON 06
PROJECT NO. * IM 275-9 (94) 5
ROAD * I 75
TYPE * GRADE, DRAIN, PAVEMENT, REHABILITATION, AND SIGNING

LENGTH OF PROJECT * 6.7700 MILES
TIME FOR COMPLETION * 055 CALENDAR DAYS
PROJECT CODE * 00-0227

DATE 03-31-00

1	THE W L HARPER CO	$29,728,278.06	4	$
2	EATON ASPHALT PAVING CO INC AND	$33,925,877.54	5	$
3	BAKER CONCRETE CONSTRUCTION INC	$34,645,570.61	6	$

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID
199	ASPH OVERLAY-12" WARR	122999.000	SQ YD		24.6000				
200	ASPH OVERLAY-13" WARR	51957.000	SQ YD		26.3000				
201	ASPH SHLD OVERLAY-12" NON-WARR	67908.000	SQ YD		22.0000				
202	ASPH SHLD OVERLAY-13" NON-WARR	28305.000	SQ YD		23.5000				
203	ASPH OVERLAY-12" NON-WARR	3275.000	SQ YD		27.1900				
204	ASPH OVERLAY-13" NON-WARR	914.000	SQ YD		36.4300				
205	ASPH PAVE REPLACE-15" WARR	25513.000	SQ YD		32.5000				
206	ASPH PAVE REPLACE-17" WARR	9830.000	SQ YD		38.2500				
207	ASPH SHLD REPLACE-15" NON-WARR	15640.000	SQ YD		29.3500				
208	ASPH SHLD REPLACE-17" NON-WARR	6121.000	SQ YD		33.6500				
209	ASPH PAVE REPLACE-15" NON-WARR	4722.000	SQ YD		30.9200				
210	ASPH PAVE REPLACE-17" NON-WARR	1155.000	SQ YD		37.0200				
211	POLE 30' MTG HT	109.000	EACH	1150.0000	1196.0000	1225.0000			
212	POLE 40' MTG HT	20.000	EACH	1250.0000	1300.0000	1350.0000			
213	BRACKET 15'	130.000	EACH	237.0000	246.4800	250.0000			
214	POLE BASE	136.000	EACH	500.0000	520.0000	550.0000			
215	TRANSFORMER BASE	146.000	EACH	230.0000	239.2000	250.0000			
216	POLE W/SECONDARY CONTROL EQUIP	6.000	EACH	5500.0000	5720.0000	5900.0000			
217	LIGHTING CONTROL EQUIPMENT	6.000	EACH	8000.0000	8320.0000	8500.0000			
218	HPS LUMINAIRE	159.000	EACH	300.0000	312.0000	320.0000			
219	HPS LUMINAIRE OFFSET	21.000	EACH	475.0000	494.0000	500.0000			
220	WIRE-1/0 ASCR W/TRIPLEX	14100.000	LIN FT	3.0000	3.1200	3.2000			
221	TRANSFORMER BASE COVER	40.000	EACH	75.0000	78.0000	80.0000			
222	FUSED CONNECTOR KIT	380.000	EACH	50.0000	52.0000	53.0000			
223	CONDUIT-1 1/4 INCH	20980.000	LIN FT	1.1000	1.1400	1.2000			
224	JUNCTION BOX TYPE B	41.000	EACH	350.0000	364.0000	375.0000			
225	TRENCHING AND BACKFILLING	25300.000	LIN FT	1.5000	1.5600	1.6000			
226	WIRE-NO. 12	3960.000	LIN FT	0.3000	0.3100	0.3200			
227	WIRE-NO. 8	15980.000	LIN FT	0.7000	0.7300	0.7500			
228	WIRE-NO. 4	52360.000	LIN FT	0.9000	0.9400	1.0000			
229	POLE-45 FT WOODEN	53.000	EACH	1200.0000	1248.0000	1280.0000			
230	SLEEVE-3"	360.000	LIN FT	50.0000	52.0000	53.0000			
231	REMOVE POLE BASE	7.000	EACH	150.0000	156.0000	160.0000			

TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
UNIT TABULATION OF BIDDERS

COUNTY * BOONE-KENTON 06 LENGTH OF PROJECT * 6.7700 MILES
PROJECT NO. * IM 275-9 (94) 5 TIME FOR COMPLETION * 055 CALENDAR DAYS
ROAD * I 75 PROJECT CODE * 00-0227
TYPE * GRADE, DRAIN, PAVEMENT, REHABILITATION, AND SIGNING

DATE 03-31-00

1 THE W L HARPER CO $29,728,278.06 4 $
2 EATON ASPHALT PAVING CO INC AND $33,925,877.54 5 $
3 BAKER CONCRETE CONSTRUCTION INC $34,645,570.61 6 $

ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID	$ UNIT BID
232	GROUND ROD	31.000	EACH	70.0000	72.8000	75.0000			
233	REMOVE, STORE & REINSTALL POLE	7.000	EACH	300.0000	312.0000	320.0000			
234	WIRE #10	900.000	LIN FT	1.0000	1.0400	1.0000			
235	BUCK-BOOST TRANSFORMER	2.000	EACH	1800.0000	1872.0000	2000.0000			
236	GUY WIRE ASSEMBLY	4.000	EACH	200.0000	208.0000	215.0000			
237	REM POLE W/SEC & LIGHT CONTROL	1.000	EACH	800.0000	832.0000	850.0000			
238	CONDUIT-2 INCH	55.000	LIN FT	6.0000	6.2400	6.5000			
239	JUNCTION BOX	2.000	EACH	100.0000	104.0000	107.0000			
240	TRENCHING AND BACKFILLING	55.000	LIN FT	5.0000	5.2000	5.5000			
241	LOOP WIRE	2544.000	LIN FT	0.3000	0.3100	0.3200			
242	LOOP SAW SLOT AND FILL	532.000	LIN FT	6.0000	6.2400	6.4000			
243	MOBILIZATION	1.000	LP SUM	660000.0000	600000.0000	740000.0000			
244	DEMOBILIZATION	1.000	LP SUM	336000.0000	370000.0000	400000.0000			
245	(A) TOTAL BID			23128278.06	25575877.54	26295570.61			
	CALENDAR DAYS @ $25,000			380	450	450			
	+(B) INCENTIVE/DISINCENTIVE TOTAL			+9500000.00	+11250000.00	+11250000.00			
	YEARS PAVEMENT WARRANTY			10	10	10			
	-(C) PAVEMENT WARRANT TOTAL			-2900000.00	-2900000.00	-2900000.00			
	GRAND TOTAL BID			29728278.06	33925877.54	34645570.61			